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[OFFICIAL NOTICE.]

Wrinkle Department, Western Gas Association.

To the Members of the Western Gas Association—Gentlemen: The season is approaching for the collection of Wrinkles for the current year for presentation to the Western Gas Association at its coming meeting. All members and friends of the Association are reminded and invited to kindly forward, to the Wrinkle Editor as below, such ideas and devices as are suitable for this Department of the Association's work. F. H. SHELTON, No. 112 North Broad street, Philadelphia.

[OFFICIAL NOTICE.]

Seventeenth Annual Meeting, Ohio Gas Light Association.

OFFICE OF THE SECRETARY,
DELAWARE, OHIO, FEBRUARY 14, 1901.

The 17th annual meeting of the Ohio Gas Light Association will be held at Dayton, Ohio, March 20th and 21st, 1901.

The Hotel Beckel has been selected as the headquarters of the Association, and the business sessions will be conducted in assembly hall of the National Cash Register Company, one block distant from the Hotel.

The President, Mr. George Whysall, of Springfield, Ohio, will call the meeting to order on Wednesday, March 20th, at 9:30 A. M.

The following papers will be presented:

"Some Observations, Pessimistic and Otherwise;" by Mr. Charles R. Faben, Jr., Toledo, Ohio.

"Gas Pumping Stations;" by Mr. E. E. Eysenbach, Columbus, Ohio.

"Business Outside the Usual Channel;" by Mr. F. W. Stone, Ashtabula, Ohio.

"The Proportional Station Meter;" by Mr. George W. Barnes, Pittsburg, Pa.

"More about Concrete Tanks;" by Mr. C. W. Andrews, Hamilton, Ohio.

Two new attractions, which should prove most interesting, have been created for this meeting, viz.: A "Wrinkle Department;" edited by Mr. Henry L. Doherty, of Denver, Col.; and a "Novelty Advertising Department," edited by Mr. B. W. Perkins, of South Bend, Ind.

The Question Box will be given special consideration. Each member is requested to make contributions for it and send them to the Secretary not later than March 6th, so that they may be printed.

An opportunity will be given any of the speakers at the meeting to correct their remarks before leaving Dayton, but not after; as all the reports will be turned over to the printers immediately after the adjournment of the meeting.

The Hotel Beckel is conducted on the American plan and the rates for the meeting will be: $2.50 to $4 per day. The Beckel hopes to entertain nearly all of the Association, and will put forth every effort to make the members comfortable. Other hotels, the Phillips, Atlas and Algonquin, are within a block of the Beckel, and their rates are from $2 to $3 per day, American plan. The most satisfactory quarters are always obtained by writing in advance to the hotel people.

The Secretary will furnish with pleasure application blanks for membership, and any further information which may be desired relative to the meeting. T. C. JONES, Secretary.

THIRTY-FIRST ANNUAL MEETING, NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

As evidence that interest in the proceedings of our Associations is not diminishing, and as proof that it is increasing, we have to say at the outset of this summary of the business accomplished at the 31st annual meeting of the New England Association of Gas Engineers, which was brought off at Young's Hotel, Boston, on Tuesday and Wednesday of last week, that the meeting was in many respects the best one ever held by the Association. And surely that is saying much; for many brilliant and useful assemblages are to the credit of the New England.

The Association was favored with good weather, the preliminaries and appointments for the sessions were well attended to and in good harmony with the ideas of the Association and its guests, the officers were active, without being confusing, and alert without being brusque, the contributors of papers were ready to perform their whole duty, the attendance was numerically strong and thoroughly representative, and the spirit of true fraternity pervaded all. In this light our initial remark that interest in the proceedings of our Associations increases rather than diminishes would seem to be justifiable, and we are sure it will be assented to by our readers when they have completed the reading of the JOURNAL'S official report of the "Proceedings."

The meeting was called to order at 10 A.M. of Tuesday, Feb. 19th, by the President, Mr. Walter R. Addicks, of Boston, whose summons to duty was greeted with a faint ripple of applause. Secretary N. W. Gifford, of New Bedford, Mass., was soon deep in the delving of the

regular order of business. The report of the Board of Directors disclosed the fact that the names of 12 applicants for active membership and 20 for associate membership had been submitted, which addition to the rolls rather goes to prove that the Association's scope for usefulness is steadily enlarging.

The new members having been welcomed to the convention and some other minor routine matters having been disposed of, the President read his annual address.[1] It was listened to with close attention, especially so with respect to his remarks on the self-intensifying gas lamp and its possibilities, and on the future of the gas engine as a means of increasing gas sales. It is also to be noted that, and the committee to whom the address was subsequently referred reported in favor of the recommendation, the President pertinaciously adhered to his suggestion of a year ago that the proceedings of the Association should be preserved in bound or book form. The address altogether was a good, commonsense document. The appointment of the Committee on President's Address was followed by the appointment of Committees on Obituary Resolutions. The Association suffered heavily through the visits of the grim reaper this year, no less than 5 members having yielded to his summons. The annual reports of Secretary and Treasurer Gifford showed prosperous conditions all round for the Association, after which many letters announcing the inability of the writers to attend the sessions were read. Following this the Secretary announced that the executors of the estate of the late Hon. John M. Hill, for many years an active member of the Association, and who had been prominent in the management of the affairs of the Concord (N. H.) Gas Light Company—Mr. Hill's demise occurred in Concord, March 4, 1900—in compliance with the will of that gentleman, had forwarded to the Association an inkstand that had been presented to him by the Concord Company in 1889. The vessel, which is a very handsome specimen of such ware, bears the inscription:

"Presented to John M. Hill, of the Concord Gas Light Company, January 1st, 1889, in token of recognition of 33 years' faithful service in the management of the affairs of the corporation."

The token was formally accepted, and the Secretary was instructed to convey to the executors an appropriate expression of the appreciation of the Association over the sentiment that prompted the bequest. It was further voted that, as the Association had no permanent home, and that as the members of the late Mr. Hill's family would undoubtedly highly praise the Concord Company's especial testimonial to his services, the same be returned them, with an additional inscription on it indicative of their thought of and action toward the donor. The Committee on Electrolysis reported progress and was continued, with instructions to make an extended and complete report next year. The President next appointed a committee on nominations, which action was followed by the roll call, which disclosed satisfactorily a rousing, good attendance. This brought the business down to the reading of papers. The first one considered was that by Mr. S. J. Fowler, of Springfield, Mass., whose "Remarks on Purification" gave rise to a spirited and prolonged discussion. In fact it was so intricate and became so involved that we fear Secretary Gifford will do quite a bit of revising in connection therewith. The second paper to engage attention was that by Mr. Carroll Miller, of Newark, N. J., who presented a well put together story respecting "The Proportion of Sulphur Removed in Each Purifying Box." Some of his findings were rather out of the ordinary line, but in the discussion that ensued he manfully stood his ground. Mr. Walter S. Allen, of New Bedford, Mass., who was one of those who represented the New England Association at the Paris Exposition of last year, then told of the "Gas Lighting at the Paris Exposition," and he told it well. In fact his narration had all the finish of an article prepared for a popular magazine. He was rewarded by an attentive and appreciative hearing. The discussion having terminated, a telegram from Mr. C. M. Higgins, of New York, wishing the Association good luck, was read, and a dip into the Question Box and the debate on the question brought up, which related to the use of prepayment meters, carried the session to the time for adjournment.

The afternoon session of the 1st day was commenced by another try at the Question Box contents, after which came the paper, by Mr. H. N. Cheney, of Boston, Mass., whose report of "A Test of a Gas Engine Electric Lighting Plant" elicited an interesting and instructive discussion. Another try at the Question Box was followed by the paper reciting "Some Sketches of Gas Governors," by Mr. J. J. Humphreys, Jr., of Worcester, Mass. The election for officers was then ordered, and the balloting showed the following result:

President.—Mr. Waldo A. Learned, Newton, Mass.
First Vice-President.—Capt. W. E. McKay, Boston, Mass.
Second Vice-President.—Col. Frank S. Richardson, North Adams, Mass.
Secretary and Treasurer.—Mr. N. W. Gifford, New Bedford, Mass.
Directors.—Messrs. W. G. Africa, W. McGregor, W. H. Snow, J. E. Nute and B. J. Allen.

President-elect Learned made a bright little speech of thanks for his promotion, and the clever gentleman blushed a bit over the rousing cheers that followed his phrases of acceptance. An adjournment for the day was then ordered. The attendance was not less than 125, and the election to membership comes pretty close to being a record breaker in the history of the Association.

The annual dinner was shared in by about 100 guests, and it was a function of the very happiest sort. Good fare, good cheer, good fellowship and good speeches were the condiments of the assemblage. Capt. White, he of the Lotos and the lots, was the Toastmaster, and to say that he was quite himself is enough said. The speeches were informal, and perhaps the ones which will linger longest in the minds of the auditors were those by Mr. E. G. Pratt and Mr. F. H. Shelton, with a few brief remarks by the Vice-President of the Consolidated Gas Company, of Baltimore. They were seated at 6:30 P.M., they arose at 10:30 P.M.

The second day's sessions were called to order at 10 A.M. The opening chapter was an invitation from Mr. G. H. Finn to visit the works of the New England Gas and Coke Company at Everett, Mass. The invitation was accepted. The veteran, Mr. C. J. R. Humphreys of Lawrence, Mass., then read his paper on the subject of "Selling Gas." Like the master of any subject upon which he treats that he is he put forth his opinions in language that was pregnant of experience. A good discussion was terminated in the passage of a resolution directing the President to appoint a committee of three to consider the subject of the selling of gas in any and all of its phases, the committee to report at the 1902 meeting. Next came the report of the committee on President's address. Mr. Fred. H. Shelton, of Philadelphia, closed the regular paper list with his recital of "How They Do Things on the Other Side." It was in his very best vein, descriptive, argumentative, humorous, graphic and truthful. The Association by rising vote here directed the Secretary to forward a cablegram to Mr. A. C. Humphreys expressive of its true appreciation of the affliction that beset him in the tragic death of his sons.

The next number to engage the members was the topic for discussion entitled "Inclined Retort and Coke Oven Practice Up to-Date." This brought out a written statement of much interest by Mr. Fred. Egner, and a lucid description from Dr. Schniewind of the practice at Everett, Mass. The Association then adjourned to inspect the coke oven works at Everett. The party arrived there at 3 P.M. and the inspection was completed at 4:30. The visitors were escorted by Dr. Schniewind and Supt. Greims, and the examination was prolonged and complete. The party having arrived in the meter room a motion to adjourn was carried, and thus ended as complete and enjoyable a meeting as any that is listed on the records of the New England Association.

[1] See page 283.

[Special Editorial Correspondence.—By Telegraph.]

EIGHTH ANNUAL MEETING, MICHIGAN GAS ASSOCIATION.

GRAND RAPIDS, MICH., Feb. 21, 1901.

Dear JOURNAL: The eighth annual meeting of the Michigan Gas Association has just been successfully concluded under the direction of its capable President, Mr. Henry H. Hyde, of Racine, Wis., and the unremitting, methodical work of its Secretary, Mr. H. W. Douglas, of Ann Arbor, Mich. Some say that there is not much further use for State Gas Associations, but this one seems to have good cause for further life, for the meeting just closed was of the lively, useful, serviceable type. That others think there is good in it would seem to be shown from the fact that 12 new members were put on the rolls—7 in the active and 5 in the associate class. The Treasurer's report also showed good work done during the year. Taken as a whole the meeting was an excellent one. We had good quarters, good officers, good papers and attentive members. What else was to be desired?

President Hyde's address was a pointed one, and he stuck to the text that the Michigan Association was in the field to stay, and not only to stay but to grow. Referring to the Michigan Gas Association Scholarship in the University of Michigan, he said the basis thereof was not a selfish one, in that the Association did not know who would eventually secure the services of the graduate. He thought inclined retorts would find no place in Michigan for usefulness, outside of the cities of Detroit and Grand Rapids. He also alluded sharply to the fact that in ordinary works in Michigan not enough attention was given to the saving and working up of residuals. The address was an instructive one and was well received. The paper by Mr. J. C. Sloan, of Port Huron, on "New Business," provoked a lengthy discussion. It is a pity that it may not be reprinted. Another paper which attracted much attention was that by Mr. Paul Challis, of Adrian, Michigan, on "Street Maps: Their Use and Abuse." The remaining numbers on the programme as given in the JOURNAL were duly presented and discussed. The paper by Mr. Zwisler, of Kalamazoo, Mich., on "Inclosed Cluster Lights with Self-Igniters," seemed to treat of a burner on the Bandsept order modified to amalgamate with the Kern. A very enjoyable entertainment at the Lakeside Club was the social feature of Wednesday evening. The hosts provided a special car and the order was that no purses were to be carried. The election for officers resulted in the following choices:

President.—Paul Doty, Grand Rapids, Mich.
Vice-President.—J. J. Knight, Kalamazoo, Mich.
Secretary and Treasurer.—H. W. Douglas, Ann Arbor, Mich.

The report of the Committee on Presidents Address contained a beautiful memorial to the late Mr. J. Walker, who died in Port Huron March 3, 1900. He had done much for the Association. Mr. Doty reported respecting the state of the fund for the University scholarship. He said it would be a pity to have to abandon the plan, but he hoped that result would not be reached, for it seemed to him the likelihood was that the contributions would be increased, now that the companies were inclined to appreciate the matter at its real value. They had sufficient money in hand to continue the scholarship for another year. The Association passed a resolution asking the Regents to equip a suitable laboratory in the university. The closing hours of the sessions were devoted to useful discussions on several short topics. The meeting was an excellent one, and what Messrs. Doty, Douglas and their associates do not know about entertaining is not worth the telling. Kalamazoo was named as the next meeting place.—B.

[Official Report.—Revised by the Secretary.]

PROCEEDINGS, THIRTY-FIRST ANNUAL MEETING, NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

Held at Young's Hotel, Boston, Mass., Feb. 19 and 20, 1901.

First Day, Feb. 19—Mobning Session.

The 31st annual meeting of the New England Association of Gas Engineers was convened promptly, at the place and date above named, through the announcement of the President, Mr. Walter R. Addicks, of Boston. The Secretary (Mr. Nathaniel W. Gifford, of New Bedford, Mass.) announced the regular order. On motion of Mr. Coggeshall the reading of the minutes of the last meeting was dispensed with.

Report of the Board of Directors.

The Secretary then read the following report from the Board of Directors:

To the Members of the New England Association of Gas Engineers: Your directors report as follows: That they have approved the applications of the following for

Active Membership,

subject to the payment of dues:

Erhard, T., Ass't Supt., Cambridge (Mass.) Gas Light Company.

Gillette, S. E., Engineer, Marblehead and Danvers (Mass.) Gas Companies.

Hawkens, T., Mgr. Knox Gas and Electric Co., Rockland, Maine.

Lawson W. H., Peoples' Gas Light Co., Rutland, Vermont.

Leonard, C. F., Ass't Supt., Fall River (Mass.) Gas Works Company.

Miles, C. H., Manager Lexington (Mass.) Gas and Electric Company.

Morse, C. W., President and General Manager, Amesbury and Salisbury (Mass.) Gas Light Company.

Macomber, G. E., President, Knox Gas and Electric Co., Rockland, Maine.

Ruggles, C. S. J., Supt., Gardner (Mass.) Gas, Fuel and Light Company.

Spear, J. N., Supt., South Boston (Mass.) Gas Light Company.

Stone, A. F., Supt., Chelsea (Mass.) Gas Light Company.

Thompson, C. F., Treas. and Mgr., Gas Light Company, Brattleboro, Vermont.

They also recommend the election of the following to

Associate Membership.

Austin, C., Treas. and Mgr., Citizens Gas Light Company, Quincy, Mass.

Baker, S. E., Chief Clerk, Pittsfield (Mass.) Gas Light Company.

Brown, G. P., Mgr., Fall River (Mass.) Gas Works Company.

Baldwin, C. H., Mgr. National Meter Company, Boston, Mass.

Chandler, F. E., President Malden and Melrose (Mass.) Gas Light Company.

Chaney, C. S., Gen. Mgr. Gas Works, Chaney Bros., South Manchester, Conn.

Davidson, R. A., Brookline Gas Light Company, Allston, Mass.

Finn, G. H., Gen. Mgr., New England Gas and Coke Company, Boston, Mass.

Farrington, A. N., Boston (Mass.) Gas Light Company.

Gardner, W. H., Jr., Boston, Mass.

Greims, O. F., Supt., New England Gas and Coke Company, Everett, Mass.

Hill, W. H., President, Citizens Gas Light Company, Quincy, Mass.

Hamlin, H. R., Boston (Mass.) Gas Light Company.

Humphreys, F. H., New Haven (Conn.) Gas Light Company.

Heustis, F. C., Cambridge (Mass.) Gas Light Company.

Montgomery, J. K., President, Chelsea (Mass.) Gas Light Company.

Nichols, W. B., Roxbury (Mass.) Gas Light Company.

Plunkett, W. R., Treasurer, Fall River (Mass.) Gas Works Company.

Wilder, C. C., Newton, Mass.

They also recommend the

Transfer from Associate to Active Membership

of Mr. William L. Walker, Supt., Fitchburg (Mass.) Gas and Electric Light Company.

They further report the resignations of Mr. N. C. Dye and Mr. Wm. Holmes.

Respectfully submitted,

N. W. Gifford, Secy.

On motion of Mr. Neal the report was accepted.

Election of New Members.

On motion of Mr. Nettleton the Secretary was directed to cast the ballot of the Association in favor of the election to membership of the gentlemen named in the report of the Directors. The Secretary having reported that the instruction had been carried out, the President announced the result and welcomed those present of the newly elected to the convention and its proceedings, in which he hoped they would take positive part. The President further appointed Messrs. Geo. B. Neal, W. E. McKay, H. A. Norton, John A. Coffin and Wm. A. Anderson a committee to introduce the new members to the old ones.

The calling of the roll having been postponed, President Addicks read the following

INAUGURAL ADDRESS.

Gentlemen of the New England Association: Still another year is added to our existence as a Gas Association, this being our 31st annual meeting. This, the first year of the 20th century, finds us not lacking in those elements that go to make up a still stronger Association. You will see by the names submitted to you for membership that interest in your profession does not seem to be langishing; it is right that it should not, and I repeat the assurance of last year that the future of the gas engineer is most promising.

The past year has produced the greatest union of gas and electricity that the century has yet seen. I need hardly say that it seems a wise step and may well be imitated elsewhere, as it is in the interest of the public from every point of view. My musing of last year was not devoid of practical elements, for I believe that our profession will one day make the gas and electricity for our communities for purposes of light, heat and power in every form, and on a scale now hardly dreamed of.

Public agitation with attack does not seem to be quite so active except in some storm centers, and one may at least look forward to the end, even in these places, if only with that degree of hope measured by the lapse of time seemingly necessary for its accomplishment.

We have repeated the policy of last year in having, in addition to our regular papers, addresses on retorts, horizontal and inclined, as well as coke ovens, all up to date. Every effort has been made to have the members state what subjects were interesting them particularly this year; and an endeavor was made to satisfy the want. I trust that the results will not be disappointing. The range of the paper list is quite wide and we must devote ourselves closely to business that we may get through our programme without slighting any subject. I desire to state that I will call the sessions to order at the specified times, and I especially request all members to be in the meeting room in seasonable time. I will not attempt to review in detail the papers presented, but make my observations as short as possible, giving room for more profitable matter.

Mr. Fowler called my attention to the Self-Intensifying Gas Lamp, two of which I have ordered from abroad for test. I regret that they have not been received for exhibition at this meeting. Quite a large range of experiments have been made by our Dr. Wing under my direction, showing the efficiency of the Welsbach mantles when used in connection with different types of burners, and at pressures ranging from normal ruling pressures up to 12 and more inches water pressure. As this subject has not yet been treated as thoroughly as it deserves, I have not ventured to present it to you this year, but I wish to say that the results obtained are most encouraging. I desire to direct your attention to the articles appearing in the gas journals on this subject. The following figures bearing on this subject were furnished me a couple of weeks ago by an English concern:

Gas Used 16-Candle Power London Gas.

Water Pressure.	Gas Consumption.	Candle Power.	Candle Power Efficiency.
8	11	350	31.81
9	12	375	31.25
10	12.5	400	32
11	13	440	33.84
12	13.5	440	32.59
13	14.5	510	37.17

It is by no means impossible that the problem of piping the modern high building for gas may be solved by using a high pressure system with incandescent mantles in burners consuming from ½ cubic feet to 10 and 15 cubic feet of gas per hour. For obtaining high pressures I am searching for the motive power and method of governing these high pressures with absolute regulation. Mr. Fowler I know is working in the same direction. It is evident that these high pressures will allow us to reduce the size tubing in use in tall buildings, even if the high pressure is only used during business hours. Such tubing

would readily supply the needs at night at present ruling pressures, and some of the lights may be adjusted for this pressure or, by means of a 2 way cock, may be used on either pressure, high or low. I am preparing such a system in our West street office in Boston. Our present scales make piping for large and tall buildings a severe tax on the practical man's judgment ; with high pressures the areas might be reduced at least one-half and possibly more.

Prepayment meters, gas stoves, gas ranges and similar devices, still retain their popularity as a means of satisfying the public and increasing our business.

Advertising in the right place, at the right time and with a careful regard to the expense account will undoubtedly be found advantageous.

I particularly wish to call your attention to the gas engine and its future. An opportunity was afforded to test a 20-horse power gas engine on electric light service. I endeavored to persuade some prominent members of this Association to test this engine, but was unsuccessful. I therefore appointed a Board composed of gentlemen connected with our Boston Companies, and requested Mr. G. E. Whitney, who has charge of our drafting room, and who is a member of the Boston Society of Civil Engineers, to act as its Chairman. Mr. Whitney is responsible for the manner in which the Board carried out this test, and one of its members, Mr. H. N. Cheney, will give you a paper on the subject. A careful study of the data will disclose its usefulness for future reference.

Without doubt with the gas engine we can obtain at least 30 kilowatts per 1,000 cubic feet of gas, and with this gas at $1.00 per 1,000, we obtain 1 kilowatt (which is equivalent to 20 50 Watt lamps 1 hour) for 3.3 cents. When you consider that by the use of the Wright discount meter, the electric light companies pride themselves in offering each kilowatt beyond a guaranteed quantity (which quantity is paid for at 18 cents kilowatt) at the low price of 8 cents per kilowatt, it should start you to thinking, particularly when you know that you can get to day absolutely perfect electric regulation, even when going instantaneously from full load to ¼ load and *vice versa*. The figures I gave in my last annual address were those furnished by manufacturers, but we can now have exact facts and results of careful tests. Many of you will be able to supplement these figures with equally accurate information. Your particular attention is directed to the good efficiency at ¼ load when compared with full power, and this I consider of great importance. Your attention is directed to the advisability of running power direct while you obtain your electricity from your dynamo on the same shaft, thus avoiding loss in transmission through the dynamo and back through the motor. My personal preference is for a vertical engine, but large bearings should be an essential feature and quick accessibility for cleaning the valves is of paramount importance. I am about installing a plant in our gas office at West Street, for elevator and other service. I hope there will be full discussion on this subject.

We will be particulaly interested in what Messrs Shelton and Allen have to say about "Gas Lighting at the Paris Exposition" and "How They Do Things on the Other Side." It will be remembered that Mr. Allen represented the New England Association at the Paris Congress.

Our good friend "Purification" will be ably handled by Messrs. Fowler, of Springfield, and Miller, of Newark. A glance at the State Inspector's report for this year will convince one that we can still learn something more about purification. Your close attention is directed to this subject. If the coke oven system is to be still further extended, purification will prove of primary importance.

We welcome again to our paper list a name so prominently identified with our Gas Associations and the gas industry, Mr. C. J. R. Humphreys, who will give us a practical business paper, and his namesake from Worcester will call your attention to the fact that there is more than one or even a dozen ways to govern your gas systems successfully. Dr. Schniewind has kindly offered to give us some fresh matter on coke ovens, and we hope to hear from Mr. Egner on inclined retorts, and from Mr. Ramsdell on horizontals and machinery, and from Mr. Prichard, on both inclines and horizontals.

The great oil well "gushers" we read of almost daily are not without interest to the profession generally.

I wish to direct your attention to the desirability of having your proceedings printed from the beginning of your Association's history to the present time. I have investigated the matter and you will find on the table the proceedings of the 30th annual meeting in pamphlet form obtained by cutting from the files of the American Gas Light Journal. It will surprise you as it surprised me, how apparently readily the Gas Light Journal could print your proceedings in pamphlet form from the same type they print their Journal copy, and thus insure a year book within 30 days of the holding of the annual meeting. Investigation in New York, however, convinced me that what seemed simple, proved to be hardly practicable, but the American Gas Light Journal with their usual courtesy, offered to give the Association the use of the electrotypes they possess, as well as their files, should the Association desire to publish their proceedings in book form. They also suggested that I take up the subject with some printing office using a linotype machine. I have done so and Exhibit "A" is a letter I have received on the subject. The Secretary can perhaps obtain better figures. It is understood that this linotype work is to be done from the printed editions of the American Gas Light Journal as a proof and not from manuscript. Mr. W. A. Wood when President, suggested publishing the proceeding, and he appointed, by authority of the Association, a committee to consider the subject. The committee never reported and history fails to identify their individuality even. Mr. Wood's recommendations are hereby renewed.

We look forward with interest to the report of the Standing Committee on Electrolysis. Those who read the English gas journals will see that London is being stirred up with this question.

A member of the Board of Directors (Captain McKay) called my attention to the fact that the members for many years have not subscribed their names to the by laws, and that it it is a matter of interest as a record to have all signatures of our members. I agree with him, and I am going to ask the Secretary to read the names of all members who have signed the roll. Those present I hope will do so during the session.

Death has laid a heavy hand on our Association this year, and was not content to take those who had passed their appointed span of life amongst us, but has taken from our midst also younger members on the threshold of a great career. You will approve, I know, my appointment of committees to report to the Association appropriate resolutions. The names of those who have passed away since our last meeting are as follows :

Active Members.

Hon. J. M. Hill, of Concord, N. H., March 4. 1900.
Mr. Henry A. Atwood, of Plymouth, Mass., March 17, 1900.
Mr. G. T. Thompson, of Denver, Col., October 1, 1900.

Associate Members.

Mr. Robert R. Smith, of New Hartford, Conn., May 12, 1900.
Mr. Fritz H. Twitchell, of Bath, Me., February 4, 1901.

You will undoubtedly approve, also, of the Secretary spreading these resolutions upon the minutes of the Association, furnishing the gas light journals with the resolutions and sending copies to the families of the deceased.

I would not be doing my duty, nor would I be satisfying a sincere feeling of gratitude, did I not refer to your Secretary and his work. If this meeting, for which we have a greater share of responsibility than any other members, meets with your approbation, I wish to say that his labors contribute in a larger measure to that end than my own. I congratulate the Association in being so well served in the office of Secretary, the most important for the success of the annual meetings. Anyone having served as the Secretary of any Association realizes the hours of labor to perform its duties.

Now, gentlemen, I leave this meeting in your hands. We have tried to serve you as you would be served, and you must make this meeting profitable one to another by your own united efforts.

Committee on President's Address.

On the conclusion of the reading of the address the message was referred for consideration and report to a committee consisting of Messrs. Chas. H. Nettleton, H. A. Allyn and F. H. Shelton.

[To be Continued]

[Concluded from Page 246.]

Mr. Dibdin's Latest Pronouncement on the Commercial Valuation of Coal Gas.

[From the *Journal of Gas Lighting.*]

The idea that the consumer requires only one fixed standard or unit of light is entirely a figment of imagination without parallel in actual practice. He does not require lights of 1° only, but all sorts, from 2 up to 20-candle power; and the chief reason for the popularity of the flat flame burner is the unique advantage of being readily adjustable to anything between a glimmer just sufficient to enable one to see the way about the apartment, and the full light requisite for reading, writing, or other employment. Nearly half the lights in a house are in passages or small rooms where a high unit is simply unnecessary waste ; and the exact photometrical value of the unit required in practice is not only subject to the surroundings—a light that would

give the impression of being sufficient for anything in a room with white walls and ceiling, would simply appear like darkness visible in an apartment panelled with old oak—but is a matter of individual taste. Get rid of the effect of furniture and environments by imagining half-a-dozen rooms exactly alike in every respect—walls papered with similar material, same pattern carpet, and so on—and no two of them will be lighted with equal candle power. One man puts up a 3-light center piece, and is not happy unless the room is flooded with a brilliant illumination. He therefore lights all three burners. Another also has the three lights; but from economy or from choice, never uses more than one. So with side lights. Other consumers will have a pair or two pairs of brackets, and use anything between one and four burners. But in any case a unit lower than that selected by Mr. Dibdin is preferred, as a number of lights break the shadows and give a more equable diffusion; and, as already remarked, a lower unit would give the poorer gases a much better chance. The consumer, or for that matter many a gasfitter, knows nothing about the photometrical value of the unit. He likes plenty of light, or does not care for too much of it; and, apart from that, the brackets or gaseliers are selected with an eye to decorative effect. The gasfitter may advise 3 burners or other number as the case may be; and his suggestion receives fair consideration, but is not the ruling factor.

But, notwithstanding all this, the consumer is not a limp and helpless individual, such as Mr. Dibdin represents, who must have his "unit" even if the equivalent goes up to 9s 3d., regardless of the rate at which the meter works. He is fairly keen on matters connected with the rate of consumption; and if the bill went up 50 per cent. from an "apparently inexplicable" cause, the unit would have to go down, and he would make alterations in the arrangements for using gas that would have the effect of knocking Mr. Dibdin's carefully plotted curves into a cocked hat. In the course of 70 years' experience in the use of gas, he has contrived to acquire a fair general notion of how to go to work in order to get good value for his money; and by a sort of survival of the fittest process, the burners best suited to the particular quality of gas supplied come to the front and are those most extensively used.

Especially is this the case in regard to different qualities of gas. There is no such thing in practice as the same make and size of burner being in general use for qualities of gas covering a range or variation of over 8 candles. The burners generally used in Edinburgh are not largely in demand in London; and if we select three towns respectively supplied with 14, 17 and 20-candle gas, we shall find that particular sizes and patterns are in vogue in each place. How is it that, as Mr. Leicester Greville happily puts it, no one is "a penny the worse?" How is it that the Parliamentary Returns are absolutely silent on this important point? If such large differences really obtained in practice, there would be very definite evidence in respect to consumption per consumer or per head of population, of a character too pronounced to have entirely escaped the attention of statisticians during the 25 years or so that have elapsed since the first return was issued. The same as regards water gas, which has been introduced in many towns without any appreciable effect on the sales of gas. It is incredible that a consumer in one town should secure three times as much value from a given quantity of gas, where 19-candle quality is supplied, than he could obtain in another town where 14-candle gas was sent out, and that such a state of things should have prevailed for half a century without attracting attention. There is no hesitancy about attacking a gas company. The consequences may be unpleasant if one publicly stated that Bone's vaunted prime English beef had an Australian origin, or that mangelwurzels are the principal ingredient in Squashers' celebrated pure fruit jams. But nothing of the sort need be feared with regard to the gas company: yet there has never been a definite charge, supported by chapter and verse from actual practice, to the effect that 14-candle gas is dear even if sold at a cheap rate.

The experiments with mixed gases seem to show that water gas, like the lower qualities of coal gas, is more susceptible to fluctuations of pressure and rate of consumption than higher quality coal gases; and this set of experiments is therefore open to the same objections. In this case, also, Mr. Dibdin goes far beyond practical limits. No company in England supplies neat water gas, and but few go beyond 20 per cent. I have commented on the utter absurdity of expecting to get practical results over a range of 8 candles from any one burner; and it is equally absurd to take a burner constructed to use coal gas, and apply it to quite a different article. But the results claimed for mixtures up to 20 per cent. of water gas could not occur in practice without some evidence of the fact in the way of increased sales or complaints from consumers. An allusion is made in the paper to apparently inexplicable rises in gas bills. These are exceptional and not general. If every resident in a street or district experienced a rise of 50 per cent., the fact would not be hidden under a bushel, or require demonstration by means of diagrams. The Parliamentary Returns give the sales of all gas undertakings and the quality of the gas they supply; and it would be more to the point if apparently inexplicable rises in the sales over any particular district could be shown.

Some explanation of this divergence between theory as represented by the paper, and practice as shown by the Parliamentary Returns, is afforded by the disagreements between the several gases tested, which would seem to show that, when operating under the unpractical condition of straining one size and make of burner over a range of 8 candles, the photometrical value is not the only thing to be considered, as the chemical composition of the gas exercises an important effect. As much may be evidenced by a careful comparison of the diagrams A, B, and C. We may note, in passing, that the greater stress is laid in the paper on the results depicted in A; and apparently the author has followed the well known example of not letting the other side have the best of it. Tracing out the curve for a No. 4 Bray's burner on each diagram, we find that the unluckly user of a 12.2 quality Widnes mixture would have to deplore an equivalent of 7s. 6d.; while with South Metropolitan 12.5 candle gas, the equivalent is under 5s. The South Metropolitan consumer gets something for his money after all. The Gas Light and Coke article is quite as bad as the Widnes, a 12 candle gas giving 8s. 3d. Change the No. 4 Bray for a Sugg No. 5 table-top, and the equivalent falls to 3s. 9d. for Widnes, 3s. 10d. for South Metropolitan, and 7s. 3d. for Gas Light and Coke. To put the thing another way, take a No. 4 Bray and a fixed equivalent of 4s. Under these conditions, a 14.5-candle Widnes gas, 14.6 Gas Light and Coke, and a 13-candle South Metropolitan gas, are shown to be of equal commercial value. The most probable explanation of the discrepancies is the difference in chemical composition in the first place, and the influence of the special treatment previously accorded to the samples in order to prepare the desired quality in the second.

If a slight difference in composition exercises so great an effect in the laboratory, under special precautions to secure uniformity, still larger variations may be expected under the rough-and-ready conditions of everyday usage; and we have a strong point in favor of fixed testing stations as against the portable photometer, and of the very elaborate arrangements made by the Gas Referees in preference to any simpler plan that leaves larger latitude to the judgment of the individual operator. These matters do not appear to have escaped the attention of those who originated the present legal testing arrangements; and, more than that, they in some sense anticipated the possibility of manufacturing a case against the gas companies by means of experiments made with burners unsuitable to the quality of the gas under examination, or used under unfavorable conditions. Mr. Dibdin's ideas appear to run in the direction of selecting burners in ordinary use—as offered for sale in large quantities by well known makers—for the standard, rather than the argand. If he followed out the spirit of the law, which prescribes that the burner should be of such a make, and used in such a manner as to do full justice to the gas, by using the burners under the conditions prescribed by the makers as likely to develop the best results, there would not be much to say against it. But what might be expected if we forced 15 cubic feet per hour through the standard burner? What would be the answer of Mr. Sugg or Mr. Bray to any user of gas who complained that his burners were wasteful and extravagant when used at two or three times the rated capacity? He would simply be told to use the burner in a proper manner. Or what result as regards economy of light might be expected if we force the sperm candle to consume 6 grains per minute; if we take an oil lamp intended to use 1 ounce of petroleum per hour and force it to use 3 ounces, or if we connect a 100-volt electric lamp on a 300-volt circuit. Would any scientist care to take the results of operations on these lines as the basis of diagrams to indicate the commercial value of sperm, oil or electricity? Yet this is exactly what Mr. Dibdin has done in respect to gas.

Striking out the experiments made under forced conditions as to pressure or rate of consumption, the makers of fishtail burners have no reason to be ashamed of the results obtained under normal conditions. In fact, it is evident that they have suffered a great injustice. The public have been accustomed to the assurance that, in practice, the duty obtainable from coal gas is about 2 or 2½ candles per cubic foot of gas consumed per hour. Some electricians, in comparing the cost of electricity with that of gas, have been troubled with serious qualms of conscience lest they should mislead by claiming as much as 2 cubic feet, and carefully explain that this is only the result when the burners are new. But the average quality of gas as actually supplied is not far

from 17 candles; and, according to Mr. Dibdin, any consumer may obtain from a gas of 17.2 candle quality a duty of 3 to 3½ candles per cubic foot, by means of Sugg's table-top burners. Some of the results even go one better than the standard argand, which is usually credited by Mr. Dibdin with too much bias in favor of the gas. These remarks also apply to Sugg's slit-union and fishtail. Bray's and Peebles' burners, with a slight exception, are all well up to a 3-candle duty; and even the "butcher's bat," usually supposed to be an extremely wasteful and extravagant article, comes out as very little below the standard argand. These particulars are taken from Table I., which is the basis of Diagram A; and as the corrresponding tables for B and C are not published, I am not able to pursue this comparison further. The figures quoted bring out the important fact that, with a 17-candle gas, the consumer can obtain from any fitter or plumber burners of the flat flame type that will, in practice, yield a duty equal to that of the standard argand. And I question whether the manufacturers of such burners would find it a difficult task to modify them in such a way as to secure equally satisfactory results from 14 candle gas.

Specifications and English Engineers.[1]

We continue to receive from various quarters complaints concerning the drafting of specifications by consulting engineers and engineers in the service of corporations and companies. Additional force is lent to these complaints by statements which have been made as to undue advantages enjoyed by foreign manufacturers. We have referred to these matters before on more than one occasion. The questions raised are, however, so important that we shall not apologize for discussing them again. The complainants assert that the specifications to which they have to work contain stipulations which are more or less unreasonable. They manifest a lack of common sense; they are archaic, out of congruity with the advanced practice of the present day; and are either drawn by old men, behind their time and out of touch with modern practice, or by young men full of theory and of no sound or well developed practical experience. It is not necessary that we should indorse these accusations; it is desirable that they should be examined.

A specification is supposed to be a statement of the nature of something which the engineer wants made, prepared for the guidance of the firm or individual who proposes to make it. The specification may be a detailed description of the thing, accompanied by working drawings; or, alternatively, it may be merely a general indication of what the wishes of the engineer are. A very wide opening is given for abuse. On the one hand, the engineer may oppress the contractor; or, on the other hand, the contractor may defraud the engineer—or, more strictly, the engineer's clients. With these facts, however, we have nothing to do just now. We are about to suppose that the specification is honestly drawn, according to his lights, by the engineer, and that the contractors are willing to work to it in the spirit as well as the letter. Under just these conditions the specification may be most harmful. Roughly speaking, those concerned in specifications may be divided into two classes. The one consists of a limited number of professional men who are constantly drawing up specifications and placing orders; the other consists of a number of firms who carry out contracts under specifications. These are not manufacturing engineers in the ordinary sense of the term, at least in this country. The distinction is important. The nature of that importance will be manifest presently.

It is generally enough admitted that in the present day it is extremely desirable, not only that the cost of work of all kinds should be kept down, but that every facility should be given for its rapid execution. The head and front of the offending of the modern specification is that it augments cost and hampers production. There can be only one way of accounting for this if it be true—namely, the incompetence of the man who draws the specification. We speak of incompetence advisedly. A man may be a very able engineer, and yet woefully incompetent in his dealings with his fellow men. Let us take a case in point; very similar things occur every day. A certain railway is being made, say, in one of the colonies. Broadly speaking, the bridge work is of a very ordinary kind. It can be divided up in terms of spans. There are 4 or 5 spans of 100 feet wanted; 50 spans of about 40 feet, and a number of girders to cross very small gullies, little more than culverts. There is no sufficient reason why all the bridges of the same span should not be identical throughout. There are, say, 5 bridges of 100 feet each, then all that are needed are 10 lattice girders, with the cross girders, etc., for a span of 100 feet, 100 plate girders for 40-foot spans, and a number of rolled girders of sufficient strength for the gullies or culverts make up the total. A man manufacturing girders or bridges on his own account would keep all the necessary material, and, indeed, many of the parts, in stock, and the purchasers could buy out of stock, and, therefore, in the cheapest and quickest market. But nothing so simple will satisfy the English civil engineer. Instead of a single type of 100-foot girder, there may be 5 types. As for the 40-foot girders, they may be of a dozen different patterns. We are not exaggerating; there is not a bridge maker in this kingdom who will not bear witness to our accuracy. Why is it that the engineer who draws the specifications does not see that he is handicapping the contractor, delaying the completion of the railway, and greatly increasing the expense? He seems never to have learned that it costs much less per bridge to make half a dozen bridges all alike than it does to make a single bridge. Nor is this all; even when the order is but for a single bridge, the engineer will apparently go out of his way to take care that the repetition work shall be as little as possible. It is, perhaps, highly scientific to state that there shall not be more than 2 bars of the same dimensions in a lattice girder bridge, but it is none the less the worst possible engineering. It is engineering of a kind at which the bridge builders of the United States are quite justified in laughing loud and long. We have not the smallest hesitation in stating as a general truth that no one is fit to prepare a specification for bridge work who is not completely informed as to the best modern methods of building up bridges, the capacities of the tools employed, and the sizes of steel bars and plates that can be regarded as always in the market. That engineer will do best who knows how to avail himself of the materials and appliances most readily obtained; and that engineer will do worst who at every step demands special sizes, special materials and special tools. In the present day these things are wholly unnecessary.

The absence of common sense in the drawing of specifications is by no means confined to such examples as we have just cited. In not a few specifications will be found stipulations which are very injurious to the best interests of the country. The civil engineer very rightly demands that the materials which he uses should comply with certain tests. A steel bar, for example, shall not break with less than 28 tons, or more than 30 tons. It must stretch 20 per cent., and stand a severe cold bending test. Such stipulations are quite legitimate, and no exception is ever taken to them. But not content with this, the engineer goes on to stipulate that the chemical composition of the steel shall comply with a certain formula. Thus not only is a certain result to be got, but it must be got in a particular way. Now, as a rule, the engineer does not really know anything about steel or its manufacture in a way that would justify him in stipulating for a given chemical composition. It so happens that he once had some steel which complied with the conditions, and he insists that all other steel shall be the same. As a matter of fact, so long as he gets a material which satisfies his tests, it is of no earthly consequence how the steel was made. It would occupy more space than we can spare to explain how this kind of specification throws work into the hands of our foreign competitors—who flatly refuse to comply with the condition, but nevertheless get the orders—and limits the number of those in this country who will tender. Specifications of this kind are simply stupid. There is absolutely not one sensible argument to be adduced in their favor. If the engineer pleases, let him specify a definite chemical composition, and abjure mechanical tests. But he is at all events wise enough to avoid this. His confidence in the perfection of his chemical formula will not bear the strain of an implicit faith in its complete utility.

We have spoken of civil engineers. But it is not for a moment to be supposed that they are the only offenders. Specifications for machinery, and particularly pumping machinery, not infrequently contain ridiculously onerous stipulations. They not only insist that certain results shall be obtained, but they dictate the means by which they shall be got. Not long since we saw a specification in which the indicated power of an engine was stated. The dimensions of the cylinders, the pressure, the kind of valve gear, the ratio of expansion, and finally, the contractor was to guarantee the consumption of steam per horse per hour. We need scarcely say that the order was never placed under that specification. An engineer is justified in stipulating for power and consumption, but he must leave the details of the way in which the steam is to be used to those who are asked to guarantee a given economy of fuel under heavy penalties. Colonel Denny, M.P., a member of the well known Dunbarton firm, in his presidential address to the Institute of Marine Engineers, delivered on January 21, referred at considerable length to the question of specifications prepared by superintendent engineers. He criticised very sharply a

1. London *Engineer*, editorial.

phase of the specification which we have not touched on, and we cannot better conclude this article than with a quotation from Colonel Denny's address. The first thing the superintendent engineer ought to think of is how little complication he can possibly do with; how he can devise an engine that will run with the least coal, the least oil, and, above all, the least amount of the human problem in the way of supervision. "But," said Colonel Denny, "we have had specifications put into our hands which appear to be designed for precisely the opposite intention. I have an instance in my mind at the present moment, in which we got a specification for an engine which was so overloaded with what I think may be called fads—at any rate, what we think might well have been done without—and consequently had so many names of persons who were to supply particular pieces that the price was enormously increased. I can even give you the extent of the increase. The engine was one which would have cost, if we had been allowed to design it, and supply it with an absolute guarantee that the work would be just as well done as by the other, £70,000. The addition of what I have called fads, and the naming of people to supply various material, brought the price up to no less than £90,000. And for what end? It threw the whole of the responsibility not upon the engine builder, but upon the engineer, who had no right to have such a responsibility upon him. He, to protect himself, specifies certain people to supply almost every article in the engine. And what was the result? As I have said, £20,000 added to the price of the engine. For what is the immediate procedure of an engine builder when he gets such a specification? He at once issues inquiries to every one of those named people, stating that their names are in this specification to supply certain articles, and what is their price. Probably 19 or 20 other people offering for the job do the same thing if they are not fools. The result is that it is rubbed into those people that their names are in. And what do they do? Very properly, make their price a first rate paying price. When I tell you that in the case of several of the articles costing most, there was no less of a difference than 100 per cent. between what we could have supplied an equally good article for and the price quoted to us by the specified contractor, you will see what bearing this has upon the subject."

Finally, we may say that the specification is an edged tool, and that it may, when improperly handled, be as dangerous as it is useful when rightly employed.

Electrolysis in the District of Columbia.

By Mr. Grahame H. Powell, in *Electrical World.*

The rapid extension of electric car lines in and about the District of Columbia, the majority of which have grounded returns, or, at best, inadequate metallic circuits, with the consequent dangers of electrolytic action to the gas and water mains of the city, as well as to the telegraph and telephone cables, has led to a recommendation on the part of the Commissioners of the District that Congress should provide more stringent penalties for failure on the part of the electric light and power companies to provide a proper metallic return for the powerful currents employed.

The recommendation of the Commissioners is embodied in an extensive report, giving the text of the legislation desired and which, it is hoped, will enable the District to compel the power companies to make adequate provision for the protection of the network of mains underlying the city of Washington.

Serious attention was first attracted to the dangers of electrolytic corrosion in the early part of 1897, the period which marked the beginning of the extension of the trolley systems about Washington. In the spring of that year the telephone companies observed that their cables were charged electrically much higher than had previously been the case. An investigation resulted in the discovery that the lead covered cables in the conduits of the company were carrying the return currents of a large part of the supply furnished the trolley roads by the Potomac Electric Light and Power Company. The telephone company sought to remove the danger to its lines by running a zero copper wire through its conduits and bonding the cables to it; but this method was only successful after the copper wire had been connected with the negative pole of the power company's generator at the power house.

In the course of his report, the engineer officer who investigated the subject of electrolysis in the District, says that "with the large increase of late years in the use of electricity for lighting and power purposes, the damage resulting to underground metallic constructions from the use of ground or uninsulated returns has greatly increased, and the evils from such an incomplete system of distribution for electricity are beginning to be fully realized. In many cities the question of the prevention of electrolytic action on such constructions is being very seriously considered. With the absence of overhead trolley roads in the city of Washington, the question has been an unimportant one until recently. Conditions have, however, changed so markedly in the last two years that it should have immediate attention. So long as the trolley roads did not enter the city, and while each one had its independent small power plant, the return of the current to its point of generation was accomplished through the ground or otherwise without any material damage to gas and water mains, etc. Recently a large central power station has been established within the city limits from which nearly all the trolley roads in the District of Columbia, and some in Maryland and Virginia, obtain their power. This station also furnishes current for public and private lighting at various points within the District. Current so generated is constantly delivered to many points, some of which are a number of miles distant. In many instances this current has to find its way back to the station through the ground and such metallic constructions in it as offer the least resistance, no proper metallic return having been provided. Where a metallic return has been provided it is uninsulated, and only partially serves its purpose." The report then goes on to point out specific instances of damage resulting from these return currents.

One of the phases of the question is set forth in a report by Capt. C. H. Davis, United States Navy, Superintendent of the Naval Observatory. Capt. Davis, in the course of his report, says that the observatory is situated on a spot selected by a commission appointed for the purpose. The site contains nearly 70 acres in the suburbs of the city of Washington and was purchased in 1882. The site chosen was one that was expected to remain free for all time from the disturbances due to the proximity of a city and the effects of traffic. As Capt. Davis says, the electric railway had not then been perfected, and no more desirable site could have been selected. The construction of the necessary buildings, the laying out and grading of the grounds, and the removal of the instruments from the old observatory extended over a period of 10 years, and to-day the place where the astronomical observations and calculations are made by the officers of the government is one of the most picturesque about Washington.

Among the many delicate instruments installed in this supposedly out-of-the-way location are a number of magnetic instruments which are self-registering by means of photography. The impossibility of using these instruments under present conditions is the occasion of Capt. Davis's report. The magnetic instruments referred to were mounted in January, 1894. He says:

"There are two lines of electric railway passing on parallel lines in a northwesterly direction on either side of the observatory grounds, the Georgetown and Tennallytown Road, with branches which extend to distances of from 7 to 8 miles from the terminus in Georgetown, the main line passing within 1,400 feet of the magnetic observatory, being the nearest, to the west. The other road runs from Washington to Chevy Chase, passing the observatory to the east at a distance of three-fourths of a mile.

"When the instruments were mounted it was immediately noticed that there was a disturbance of the vertical force trace during the hours when the cars were running on the Georgetown and Tenallytown road. This disturbance was not at first sufficiently serious to destroy the value of the observations. It was apparent in a widening and blurring of the line (trace), and the question was raised as to whether the disturbance was mechanical, and an experiment was undertaken to determine this, with a negative result. The disturbance remained about the same until the spring of 1897, when it gradually assumed larger proportions, and began to show itself also in the horizontal force and declination, the increase in disturbance being attendant upon a very heavy increase in the traffic of the road. It became evident that the effect of currents from the roads operated not only to blur the trace, but to increase the vertical force. * * *

"The disturbances so far noticed have been traced directly to the nearest road, the Georgetown and Tenallytown, but were traffic on this road to cease the observatory would still be within the radius of influence of the Washington and Chevy Chase Road, three-fourths of a mile distant, the effects of which are obliterated in the preponderating influence of the closer road. * * *

"In addition to the disturbances which can be traced to the electric railway, there are during the night hours, at more or less regular times, small disturbances which are probably due to throwing off the current in arc light circuits in the city, these circuits having a grounded return wire.

"It thus appears that the use of powerful electric currents for com-

mercial purposes has destroyed the usefulness of the only two magnetic observatories on the North American continent. That is, considerations of gain so far outweigh considerations of science and knowledge that the latter do not enter where questions of money prevail."

The report of Mr. Walter C. Allen, the inspector of electric lighting of the District, which accompanies the Commissioners' recommendation to Congress, contains a great deal of interesting reading and shows a careful and intelligent investigation of the subject of electrolysis.

Mr. Allen says: "This inspection of the trolley roads involved more than mere readings of the potential difference between water main and rail. It embraced a thorough examination of the feeding circuits, the size and efficiency of the return, and the general condition of the road beds. This ground was gone over quite thoroughly in the fall of 1895, and report made of the results. Since then several important changes have occurred to increase the danger to which the mains are exposed. The Potomac Electric Power Company, which was then just beginning to operate to any extent in the District, had its power plant in the station of the Georgetown and Tenallytown Railway Company, and confined its operations to furnishing current for a limited number of incandescent lamps, both public and private, on the alternating system, and to supplying current to the above mentioned railroad and to the newly installed Washington and Great Falls Electric Railway. Since then it has, with commendable enterprise, extended its lines to all portions of the District, besides reaching railroads operating both in Maryland and Virginia exclusively, until now it is an important factor in the electrical engineering field. The new power house of the Company, in Georgetown, contains the most modern machinery, well adapted to the service to which it is put. * * * In addition to the alternating system employed by this Company, which is a complete metallic system and does not enter into the question involved in this report, it supplies current from its grounded railway generators to public arc lamps and to stationary motors, besides running several overhead trolley roads."

Mr. Allen concludes that the solution of the problem is quite simple, though legislation is necessary before the railroads can be compelled to adopt the remedy. He says the extension of the underground electric system, such as is employed on the Metropolitan Railroad lines, a local corporation, is, of course, too expensive to put in operation; but its substitute, the double trolley, he believes, can be easily installed and successfully operated. Either this must be done or some other equally good metallic circuit system must be provided.

In a former report on this same subject, Mr. Allen calls attention to a case of electrolytic action. The water main was comparatively new, having been down only about 18 months, and showed no signs of damage; but the service pipe was badly corroded and was, in fact, leaking at one place where the current had eaten entirely through.

Capt. Davis, in a report written prior to the one already quoted, says: "As these railways are now managed, it would probably be necessary to remove our magnetic instruments to a distance of at least two miles before the effects of local disturbances would cease to be felt. This would retire the observatory from the national capital, which, in view of the amount of money already spent here and the beauty and fitness of the site in all other respects, is not to be thought of. The only other alternative is to discontinue magnetic observations here. This would be a loss to science, because there are only two magnetic observatories on the continent of North America, the other one, situated at Toronto, being unfortunately in the same predicament as ourselves, owing to the close proximity of a trolley road; so that the accumulation of accurate magnetic observations, which are of incalculable value for the future solution of one of the great problems of nature, has practically ceased in North America."

The Senate Committee has reported favorably on the proposed bill, the main provisions of which are as follows:

"That each and every street railway company in the District of Columbia using the overhead trolley system for the propulsion of its cars, or using any other electrical system employing an uninsulated, a grounded, or a rail-return or feeding circuit for the current, shall equip its lines with the double trolley system, or other equally good insulated metallic circuit system.

"That after the passage of this act it shall be unlawful for any person, company or corporation in the District of Columbia to furnish current for electric light, heat or power on a circuit or system, any portion of which is grounded or connected to any grounded construction, or which is not thoroughly insulated from the ground. It shall be unlawful for any person, company or corporation in the District of Columbia to use any dynamo, generator, motor or transforming device in connection with any lighting or heating apparatus for the production or utilization of electric current any pole or terminal of which is grounded or connected to the earth or any grounded construction."

A penalty of $25 a day is provided for each day's non compliance with the provisions of the act.

West's Improved Machine for Charging Retorts.

English letters patent were recently issued to Mr. John West, of Manchester, England, for improvements in machinery for charging retorts. The invention is mainly concerned with an improved scoop and the method of operaiing it. The charger for conveying the coal into the retort consists of two semi circular scoops carried by a carriage having a center bar with plates at each end for carrying the ends of the scoop shafts or journals. The end plate which enters the retort first has two suspended chains or flexible bands fixed at one end to the plate and at the other end to the sides of the scoop shafts, so that when the scoops partially revolve the scoop shafts will wind on the chains or flexible bands, and the scoops will thereby be raised during the operation of emptying the coal, and when reversed they will be higher from the bottom of the retort than if they worked round on a fixed center, thus giving more clearance for passing over the coal during the operation of withdrawing the charger from the retort. The scoops, during the operation of being reversed, will be kept in position laterally by a movable guide plate working vertically between the ends of the scoop and the charger carriage plate.

Each scoop is similar in section, and consists of two semi-circular scoops, one within the other, and moving concentrically to each other when being reversed, and they are so arranged that when they are in position for receiving coal they are opened out to form two wide scoops side by side and when they are reversed to empty the coal in the retort one part of each scoop folds up inside the other concentrically, to prevent the edges of the scoops dragging the coal out of the retort when the charger is withdrawn. The inner parts of the semi-circular scoops are also provided on their outer edge with hinged extension pieces which come in contact with guides fitted to one of the charger end plates, and when the scoops are in position for receiving coal the hinged extension pieces are caused by the guides to open out to increase the width over the scoops and the height of the scoop sides, thus increasing the capacity of the charger for holding coal.

Gearing is fixed at the ends of the scoops for reversing them, and this gearing is actuated by a rod attached to the charger carriage for driving it in and out of the retort; and this carriage is provided with wheels for running on the bottom of the retort and on the framework of the charging machine when it is out of the retort.

The invention is illustrated as applied to both power and manual charging machines, but as it is similar in both cases the power machine only will be referred to here. Fig. 6 is a plan of part of a power machine showing the arrangement of the chains for driving the scoop in and out of the retort. The chains are passed round the double pulley *A*, fixed upon the rod of the charger, so that they will rotate the rod when required for reversing the scoops. Suitable stops on the double chain pulley fix the degree through which the pulley can be rotated, and there are also suitable suitable stops on the frame against which the carriage *B* will come, and thus regulate the stroke of the charger. These stops will connect to and release the pawl *C*, holding the double chain pulley *A* in the position required according to the position of the scoops in the charger. The pawl *C* is fitted to the carriage *B*, and when the carriage arrives at the limit of its stroke it drops by its weight in front of the stop on the frame. Before the charger is withdrawn from the retort the scoops have to be reversed by the pulling out chain giving a revolution to the double chain pulley *A*, when the pulley comes against a stop, and the continued further pulling of the chain pulls the charger out of the retort. It may happen that the power required for reversing the scoops may be in excess of that required for pulling the charger out of the retort, and consequently the charger would be withdrawn from the retort without being reversed. This is prevented by the pawl *C*, which drops over one of the stops on the frame. When the scoops have been reversed a projection on the side of the double pulley *A* raises the pawl and allows the charger to be withdrawn.

The charger is drawn to a larger scale in Figs. 1, 2, 3, 4 and 5. The carriage runs on three wheels and supports two semi-circular scoops *G*, and has a center bar or backbone *E*, with plates at the end for carrying the ends of the scoop shaft. The end plate which enters the retort first has two suspended chains (Fig. 4) fixed at one end to the plate and at the other end to the sides of the scoop shafts, so that when the scoops

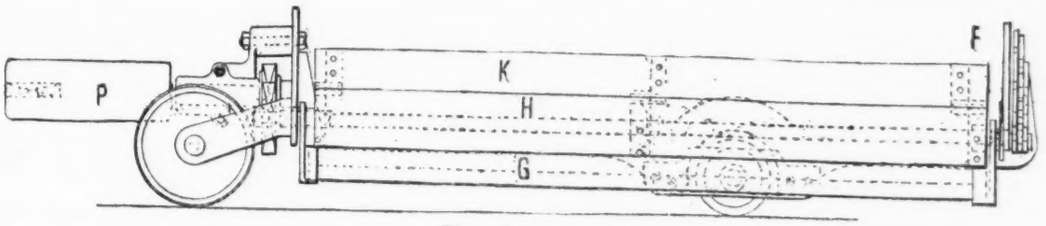

Fig. 1—Side elevation of charger.

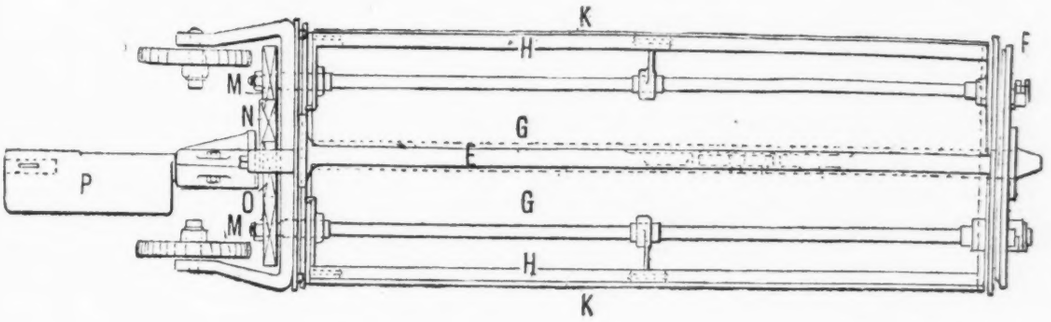

Fig. 2—Plan of charger.

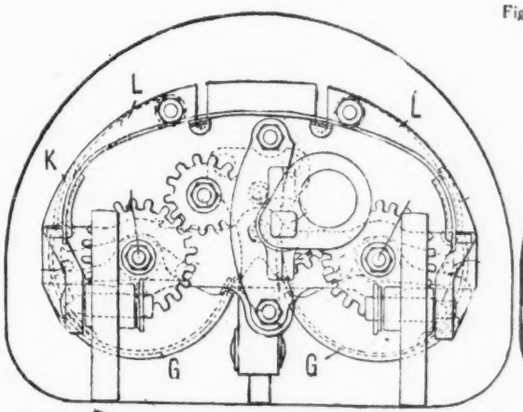

Fig. 3—Showing gearing for reversing scoops.

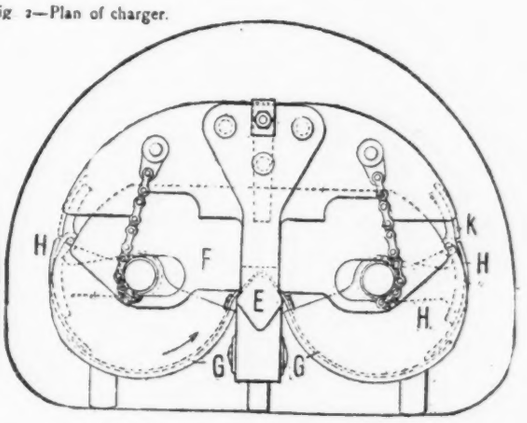

Fig. 4—Showing scoops in position for receiving coal

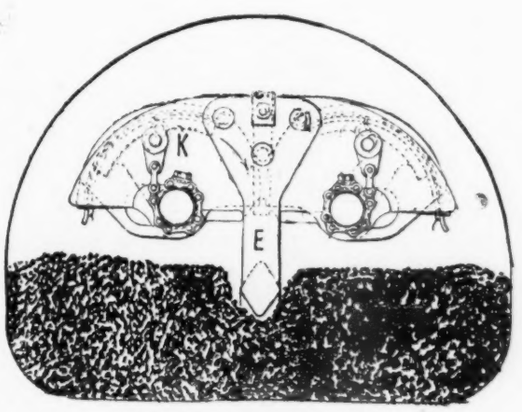

Fig. 5—Showing scoops in the retort.

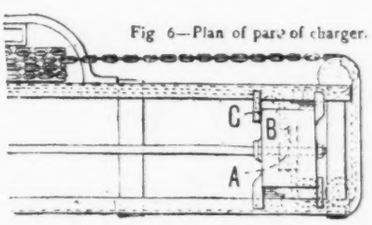

Fig. 6—Plan of part of charger.

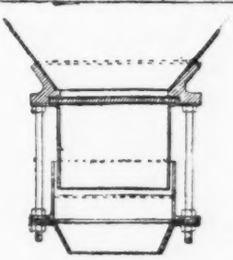

Fig. 7—Measuring chamber

partly revolve the scoop shafts will wind on to the chains (Fig. 5), and the scoops will thereby be raised during the operation of emptying the coal. The movable guide plate *F* is between the scoop ends and the back plate, and when the scoops are being reversed it works up and down vertically, and is free to adjust itself to the position of the scoops.

Each scoop consists of two parts *G* and *H*, and when they are being reversed, one slides within the other concentrically by the rotation of the shaft, to which the part *H* is fixed by the arms, and after the part *H* has made a portion of a revolution and working inside the part *G* which is kept stationary by its own weight, the edge of the part *H* comes into contact with the stops fixed to the part *G* when the continued motion of the part *H* causes both parts, together with the hinged extension pieces, *K*, forming the complete scoop, to reverse, until it arrives in the position shown in Fig. 5. When they are in the position shown in Figs. 3 and 4, ready for receiving coal, the scoops *G*, and *H*, with the hinged extension pieces *K*, are opened out to form two wide scoops side by side.

To insure the parts of the scoops being brought back to their proper positions, stops are provided to prevent such parts from being turned too far. Thus, when the scoops are being reversed from the position shown in Fig. 5 to the position shown in Figs. 3 and 4, one end of the part *G* when it arrives in its place, comes against a stop fixed to the end charger plate, and the continued rotation of the shaft causes the part *H* to slide out of the part *G* until a stop comes against the top

edge of the end of the scoop *G* when no further motion can be obtained, as the edge of the part *G* is forced against a stop.

The parts of the scoops are also provided on their outer edges with hinged extension pieces *K*, which come into contact with the guides *L* fitted to the end plate, and when the scoops are in the position for receiving coal the hinged extension pieces are kept open by the guides *L* so that the width over the scoops is increased.

The gear wheels *M* are attached to the ends of the scoops, and gear into wheels *N* and *O*, the latter being part of a socket spindle *P* and carried by a bracket. This spindle and gear wheels are connected with the rod of the charger before described. The spindle *P* is weighted on one side for the purpose of assisting to give the scoops an even turning movement, and to keep them in position when the scoops are at rest ready for receiving coal.

Fig. 7 shows a measuring chamber added to the hopper of the machine. The capacity of this measuring chamber can be varied at will by means of the adjusting bolts.—(Complete specification accepted 5th January, 1901.)

Engineering Work of the Glasgow International Exhibition.[1]

A very interesting lecture was delivered at a meeting of the Glasgow University Engineering Society, on the evening of Thursday, January 31, by Mr. Thomas Young, M. Inst. C.E., on "The Engineering and and Electrical Work of the Glasgow International Exhibition, 1901." Mr. Young, as most of our readers know, is the engineer and electrician of the Exhibition, and has had considerable experience in this class of work by being connected with the previous exhibition held in Glasgow, in 1888, and with others in Edinburgh and Newcastle-on-Tyne. After briefly describing the main buildings, Mr. Young proceeded to refer to the boiler-house and to detail its contents. Beginning with the Lancashire steam boilers, of which he said there are four, lent by Messrs. Penman & Co., Strathclyde street, Glasgow, the lecturer continued: Each boiler is 30 feet long by 8 feet in diameter, and is designed to work at a pressure of 120 pounds per square inch. The fire grate area in each case is 39 square feet, and the flues are fitted with the ordinary cone tubes to increase the water circulation. These boilers will supply steam to the various exhibitors requiring such motive power, and in consequence of the great demand for this force, an additional supply will be taken from the high pressure ring main by a branch 9 inches in diameter, passed through one of Messrs. D. Auld & Sons' reducing valves. The pipes for the supply of steam to exhibitors are made of lap-welded wrought iron and mild steel, with mixed pieces consisting of cast iron crosses and tees, and the necessary steam stop valves, isolating valves, separators, traps, expansion joints, and section cut-out valves are lent by Messrs. Glenfield & Kennedy, Limited, Kilmarnock. The total length of this piping exceeds 1,000 feet, varying in diameter from 12 inches to 6 inches, and is led throughout the Machinery Hall in wooden trenches 4 feet wide by 5 feet deep, under the passage flooring. All the flues converge into one main flue at the rear of the boilers, having an area of 20 square feet, into which the hot gases are led through one of Messrs. E. Green & Son's economizers, which possesses 192 vertical tubes, arranged in two nests of 96 each.

Many devices have been put forward for increasing coal consumption (hence the water evaporating power of boilers), and at the same time to better regulate the varying effects different atmospheric conditions have upon natural draught. These artificial means are divided into forced and induced draughts, and the Exhibition has been fortunate in obtaining from the Sturtevant Engineering Company the use of an induced draught plant which is being placed between the chimney and the economizer, and consists of a large fan built alongside of, and connected with the interior of the flue by sheet iron suction and discharge pipes formed square. This fan is driven by a 5 inch by 4 inch vertical steam engine at 450 revolutions per minute, and draws the products of combustion from the flue, thus producing a partial vacuum, and inducing the additional air required through the fires. By this process the possibilities of poor draught are avoided, as a slight increase in the speed of the fan provides the necessary air pressure, and also enables a cheaper fuel to be used—a matter of importance at the present time, in view of the cost of coal. A further advantage claimed for this artificial draught is that large and expensive brick chimneys will be, to a certain extent, rendered unnecessary, as these induced draught plants can be more cheaply installed, and more easily kept in repair.

Passing now to the boilers used to generate steam for the electric engines at 160-pound pressure per square inch, the first in order and adjacent to the Lancashire boilers, is one of Messrs. Davey, Paxman & Co.'s patent economic boilers, 14½ feet long by 8 feet 9 inches in diameter. One of Green's patent economizers will be placed behind the boiler, to utilize waste heat. Attached to the side of this boiler and directly connected with its flues, is one of the firm's superheaters, provided with dampers which are manipulated by levers in front, so that, when desired, the saturated steam may pass through the process of superheating before entering the engines. The Stirling Boiler Company, Limited, Edinburgh, supply two of their special water tube boilers, each with a grate area of 54 square feet, and heating surface of 3,250 square feet. These tubes in the boilers are nearly vertical, and arranged in staggered rows, thus dividing the fire gases into small sections, so that before leaving the boiler they are made to pass successively over the whole length of the different banks of tubes and pass off where the feed water enters. It has been arranged to fire one boiler with a Vicar's mechanical stoker, while the other will be gasfired by means of a gas producer lent by Messrs. W. F. Mason & Co., Manchester. This producer is capable of converting into gas 15 cwt. of coal per hour. The producer furnace will be situated outside the boiler house, and the gas conducted to the specially prepared boiler fireplace by means of brickwork flue laid under the floor, fitted with cast iron manholes, etc.

Messrs. Babcock & Wilcox, Limited, will work two large sized boilers of their well known type, each with a heating surface of 5,137 square feet. Each boiler will contain 234 wrought iron tubes, each 4 inches in diameter, with ends expanded into continuous staggered headers. The several sections are connected at the rear end with a steel cross drum of 20 inches in diameter, 8 feet 6 inches long, on which is placed the 7-inch saturated steam valve. In addition, each boiler is fitted with one of the firm's patent superheaters, capable of imparting from 100 to 120° F. to superheat the steam produced. Each boiler is also provided with a Babcock & Wilcox chain grate stoker worked by eccentrics on a shaft on the upper front of the steam drums. Under favorable conditions of steam consumption in the engines these boilers will be good for 2,000 indicated horse power. Adjacent to the boilers just described is one of the same company's marine type of boiler, similar to those supplied to the Allan steamships. The water tubes are $3\frac{3}{16}$ inches in diameter, and lie straight on an incline as in the land boiler; but in this type the steam and water drum, which is 36 inches in diameter, is placed transversely over the tubes and in front with a partial overhang. The grate area is 55½ square feet, and the heating surface 2,050 square feet. The marine boiler is particularly interesting at the present time on account of its promising competition with the much discussed Belleville water tube boiler.

Each of the water tube boilers (excepting the Babcock & Wilcox marine) has a wrought iron chimney 80 feet high by 4 feet internal diameter, with brick base 8½ feet high and 7 feet square, capped with a cast iron baseplate, built in four sections and bolted together, every plate being secured to the brickwork by four anchor bolts, each 8 feet long. The marine boiler has a 3 foot wrought iron flue led into and connected by a riveted flange to the nearest chimney. The four Lancashire boilers have one wrought iron chimney in common, 80 feet high and 6 feet internal diameter, which also rests on a cast iron ribbed bedplate, built in segments, and secured to a brickwork foundation by long tie bolts. The chimneys and bases are suitably protected by a lining of firebrick, the funnels being maintained in their position by ¾ inch flexible steel guys, fitted with tightening screws, etc.

As the supply of coal to these 10 boilers, averaging a working capacity of 5,000 indicated horse power, will be a considerable item, the fuel is to be delivered in the boiler house by a siding from the Caledonian Railway, passing first over one of Messrs. W. & T. Avery's patent automatic weighbridges, with a capacity of 20 tons, and built on the cantilever principle. The gross weight of coal and wagon will first be taken, the empty truck being reweighed on its return after delivering the contents. The temperature at which steam boilers are supplied with feed water will always be a vital point in their economy, not only in increased production of steam from the same thermal value of coal, but in reducing strains in the boiler structure itself, the highest efficiency being maximum temperature at a minimum cost. The two principal ways by which this economy is effected are waste heat from the fires and exhaust steam when discharged into the atmosphere. The former is generally utilized in the economizer system, as in Messrs. Green's already described; the latter is used in feed water heaters. Messrs. Joseph Wright & Co., of Tipton, are placing as a working exhibit two Excelsior patent non-pressure heaters which contain filter and oil separator, and two No. 12 Berryman patent heaters. These heaters, which

1. *Engineering*, London, England.

are placed in the western end of the boiler house, are 16 feet and 19 feet 6 inches high respectively, each being 3 feet 6 inches in diameter. The Excelsior type is supplied by water at gravitation pressure through a 4-inch automatic feed valve, and falls over spreaders on to a steam baffle plate, and then through perforated grease plates into a chamber whence it is drawn by the pump. In the Berryman type the feed water is forced under pressure by the pump and discharged from the top by a 5-inch outlet. These heaters will be served by a set of Messrs. Worthington's 9-inch by 6 inch by 12-inch vertical direct acting feed pumps, capable of delivering 35,000 pounds of water per hour against a pressure of 120 pounds per square inch.

In the feed heater and pump room are placed two of Messrs. Royles' class A heaters and two of class B. The former are steam fed through 10 inch exhaust inlet branches on the upper part of the heater, the steam circulating as it descends around a number of Row's patent indented tubes made from solid drawn copper pipe, which forms the specialty of this firm's heaters. At the same time the feed water is forced upwards through the tubes, which in consequence of their peculiar formation offer a large surface to the action of the steam. The heaters are fitted with drain pipes, relief valves, pressure gauges, etc., complete, and occupy comparatively little space. They will be served by a set of Messrs. Carruthers' compound vertical duplex pumps with cylinders 5 inches and 9 inches in diameter, and pumps 5 inch by 10 inch, capable of delivering 35,000 pounds of feed water per hour against a pressure of 160 pounds per square inch, and are fitted with positive valve gear; that is to say, the gear is actuated directly by means of levers from the pump rods. Feed waters which contain much sediment or chemical impurities should not be passed through tubes, as these, after a short time, become incrusted internally. Messrs. Royles have adapted their class B heater to suit these conditions, and in this case the mode of working is reversed, the exhaust steam passing through the Row tubes downwards, and the feed water circulating around the tubes in an upward direction, finally passing a 4-inch outlet to the boilers. This type is amply provided with inspection and cleaning doors, and, like the others, fitted with relief valves, gauges, drains, etc. A by-pass is provided, so that the feed may be sent direct to the boilers should the heater be open for repairs or cleaning. The B class heaters are worked in conjunction with a set of Messrs. G. and J. Weir's patent vertical direct acting feed pumps with cylinders 9½ inches in diameter; 7 inches in diameter; and stroke in each case of 21 inches.

At the last Exhibition in Glasgow, in 1888, the electric engines transmitted power to the armatures by belts or ropes, the engines and dynamos being generally placed in two lines. Nowadays the practice is to couple the engines directly to the dynamo shaft, thus allowing cumbrous straps to be discarded, and at the same time effect great economy in floor space. With this preliminary observation, we shall now pass in hurried review the main electric engines installed to generate current at 250 and 500 volts for lighting purposes, and for supplying motive power to exhibitors. Messrs. Davey, Paxman and Co., Limited, exhibit at work a coupled compound engine of 30 inch stroke, running at 150 revolutions per minute, and directly attached to one of the London Electric Construction Company's dynamos. A re-heater with a supplementary steam pipe branch from the live steam main is fitted between the high and low pressure cylinders. This engine and dynamo supplies electricity at 500 volts.

Two Willans and Robinson vertical central valve, type of engine so extensively used in power station plant, will be shown. Each engine is capable of developing 1,500 indicated horse power, the average working being 1,200, and giving electric current at 500 volts. One engine has a Crompton dynamo attached, while the other works in conjunction with a Schuckert generator.

A coupled compound horizontal engine by Messrs. Robey, of Lincoln, is exhibited. Its cylinders are 20½-inch and 35 inch in diameter, with a 42-inch stroke, making 90 revolutions per minute, and developing 500 indicated horse power. This engine acts in consort with a Mayor and Coulson dynamo, and has on the main shaft a flywheel 16 feet in diameter, each cylinder being fitted with Richardson Rowland patent valve and trip gear. The same firm has also a high-speed vertical compound engine, with dynamo combined. The cylinders are 10½ inches and 18¼ inches in diameter, with a stroke of 11 inches. In close proximity they have also a vertical compound high speed engine, in combination with a Scott and Mountain dynamo. The cylinders are 8½ inches and 14½ inches, with a 6-inch stroke, running at 550 revolutions per minute, with forced lubrication.

Messrs. Ruston, Proctor & Co. exhibit one of their high speed vertical inclosed engines, the cylinders being 9½ inches and 15 inches in diameter, having an 8 inch stroke, combined with a dynamo, and capable of indicating 100-horse power. Attached to this engine, as in several others, is a steam separator or drier, to insure the non-passage of water into the cylinders—a vital point in high speed plant.

Messrs. Bruce, Peebles & Co., Edinburgh, have a 200-kilowatt dynamo, coupled to a Bellis and Morcom engine of the vertical triple expansion high speed type with inclosed casings, to which is also attached a steam separator to steam inlet pipe. Messrs. Sisson & Co., show a vertical engine indicating 125 brake horse power combined with a Clarke-Chapman dynamo. An Alley and MacLellan 3-crank tandem compound vertical engine coupled with a 6 pole dynamo comes next. The engine will develop 300 horse power, and the dynamo is wound to give current at 500 volts. Messrs. Scott, Mountain & Co., and the Edison & Swan Electric Company have also electric steam plant generating current, the former with a compound vertical engine with 11½-inch and 21-inch cylinders, 10-inch stroke, and indicating 130 horse power. The dynamo of the latter firm is coupled with a Browett-Lindley vertical compound engine, the cylinders of which are 12 inches and 21 inches in diameter respectively. The stroke is 9 inches, and the engine is good for 200 horse power. The combinations of steam and electric plants, just described, typify the most advanced principles in the design and arrangement of electric power generating, and indicate the result of present effort and skill to obtain the highest efficiency combined with the greatest economy.

Mr. Young afterwards described the electrical work of the Exhibition, and at the close of his lecture was awarded the customary vote of thanks. The Exhibition, it may be added, is in a forward condition, and everything is excepted to be in readiness for the official opening on Tuesday, May 7.

Gas Oil Prospects in England.

A correspondent in the English *Gas World*, writing on the topic named in the heading, says: It has been stated in some quarters that the recent high prices in gas oil have been the result of "cornering" operations by producers and sellers of that material. Inquiries I have made amongst those most likely to be well informed on such a point lead me to believe that there is little or no ground for adopting such an explanation. The fact of the matter is that the supply of gas oil is in the hands of a very few firms, all of whom are quite familiar with the general position of the oil market, with the figures of present stocks, and the prospects of future supplies. It is little wonder, therefore, that the prices formulated by them, being founded on the same data, should run out to practically identical figures. The wonder would be if they did not.

With respect to future supplies, I do not think there is any substantial reason for alarm, in the immediate future at any rate, for there seems to be plenty of readiness to tackle the gas oil department of the oil trade, not only amongst American producers, but also amongst the suppliers of Russian, Roumanian, and Borneo oils. I know at the present moment of quarters in which many thousands of tons of gas oil can be bought for delivery next year, or even in 1902. With these numerous sources of supply open, the position of carburetted water gas is by no means so precarious as some recent press utterances would have us believe, and those gas managers who possess carburetted water gas plant may therefore be advised to attach no particular weight to the dismal forebodings which have been expressed.

At the same time my inquiries lead me to think that there are a few points connected with the subject of gas oil supply which gas companies might well consider, in their own interests. To some of these points I would briefly refer, as follows:

There seems to be a somewhat general impression that gas oil is merely a waste product in the oil industry, and that, consequently, oil producers are glad to get rid of it at any price. The extremely low figures at which it was sold some years ago lent color to that supposition, but when it is remembered that these excessively cut prices were due to fierce commercial rivalry and were quite abnormal, it will be seen that conclusions based on them are likely to be erroneous. It is very unlikely that, except under similar circumstances of trade rivalry, such low prices will ever occur again.

The production of gas oil is, of course, dependent on the laws of supply and demand. If the price is too high the demand lessens, whereas if the price is too low, the oil producers find it no longer to their interest to produce gas oil, and they consequently divert their commodity into other channels, in doing which, it appears, they have no difficulty. It is, therefore, largely a matter of sufficiency of induce-

ment which determines whether the supplies of gas oil shall be abundant or scanty. If the prices obtained are adequate, the trade is worth pursuing; if inadequate, the production is lessened. In the latter event a scarcity results later on, and prices run up to prohibitive figures. Such fluctuations do no good either to the oil industry or to the gas industry, so that it is to be hoped that some *via media* may eventually be found whereby such occurrences may be avoided.

It is possible that a solution of the problem, securing both the permanency of business, which is the desideratum of the oil industry, and the uniformity in price and the freedom from fluctuation, which are desirable in gas working, may be found in a system of long contracts whereby a fair fractional part of a gas manager's oil purchases are settled some years in advance.

In considering the matter of price, it should, of course, be remembered that gas oil is a distillate—in other words, a manufactured article, and not a raw product; and that the price at which it can be put upon the market over here is therefore determined by certain limiting factors, of which the cost of production, freight, and storage are samples, which cannot be cancelled.

In the early days of carburetted water gas American gas oil held the field; then came Russian; and now there are in addition Roumanian and other gas oils in the market. It is, therefore, a safe recommendation to gas undertakings that they should encourage competition by not committing themselves wholly to one source of supply. The greater the number of suppliers, the greater the security for carburetted water gas development.

Amongst the various points which my inquiries have brought to notice is one which should not be very difficult to remedy—viz., the shortness of notice sometimes given in respect to tenders. This shortness of notice is prejudicial to the interests of gas companies. Gas oil is an imported material, and the oil firms in this country, before giving a firm quotation for future deliveries, have often to confer with their friends abroad in regard to collecting, freight and delivery, which matters require considerable time for their complete adjustment. If, owing to insufficiency of notice, the tenders have to be made up in a hurry, the tenderers have no option but to allow ample margins of safety in estimating the various items, and the result is that the aggregate quotation is not so satisfactory from the customer's point of view as it would have been allowed for more exact making up. The mere item of freight varies enough during the course of the year to make a difference of ½d. per gallon in the delivered price of gas oil in this country. A cheap freight might mean, for example, a quotation of 3½d. per gallon, whereas a dear freight, secured possibly in a rush, might run the same oil up to 4d. It will readily be seen, therefore, that it is to the vantage of gas companies to give ample notice in respect to their gas oil contracts.

It is a pity that the time for securing cheap freights is not always identical with the dates at which gas companies are inviting tenders, for if it were so some better bargains in oils could doubtless be obtained. Freights are uncertain items to forecast, and the experience most general amongst buyers of either gas coal or oil is that the freights are most favorable when the inquirer is not on the market. Perhaps the best recommendation that can, under the circumstances, be given to gas oil consumers is that they should be ready to entertain a satisfactory offer of gas oil whenever it occurs. If they wait until their usual date of contracting comes round, they will probably find the market changed, freights high, and good bargains conspicuous by their absence.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

At a meeting of the City Council of Aberdeen, So. Dak., Mr. S. C. Hedger made an offer to purchase the plants of the Aberdeen Gas and Electric Light Company, and to expend sufficient money in bettering the same, to the point of bringing them to a good state of efficiency, if the city would give an acceptable franchise and agree to take a certain number of arc lights, paying therefor at the rate of $125 each per annum.

The proprietors of the Atlas Pipe Wrench Company, of New York and San Francisco, inform us that the increasing demand for their specialty has compelled them to add to their manufacturing facilities. They are now ready to deliver wrenches in any quantity, and can hereafter promise immediate shipment.

Mr. M. Timmons Walker has resigned the position of General Manager of the Rockville (Conn.) Gas and Electric Company to accept a similar position with the Fort Madison (Iowa) Gas Light Company.

At the annual meeting of the Meriden (Conn.) Gas Light Company the following officers were chosen: Directors, James R Taylor, F. C. Sherman, Walter Hubbard, C. F. Linsley, Samuel Dodd, E. J. Doolittle, and George M. Curtis; President, Walter Hubbard; Secretary and Treasurer, Samuel Dodd; Superintendent, Chas. A. Learned.

The following is the test of the decision handed down by the Board of Gas and Electric Light Commissioners as a result of the hearing of the case for a redu tion in the rate charged by the East Boston (Mass.) Gas Company:

"The district supplied by this Company is separated by water ways from the other portions of the city, no other company supplies gas in the territory, and the management of the Company and its ownership are entirely distinct and independent from that of any of the other gas companies in the city. Its works are located upon tide water, and its gas is made by the processes in common use from coal landed at its own wharf.

"Prior to 1893 the price of gas was $1.75 net; in that year it was reduced upon the recommendation of the Board to $1 50 net, at which price it remained until July, 1899, when it was reduced by the Company to $1.40. Its total output during the year ending June 30, 1900, was about 50,000,000 cubic feet, of which about 18 per cent. was supplied to the city buildings and for street lighting at a lower price.

"In the study of the Company's condition and a consideration of its ability to favorably respond to the request of the petitioners, the attention of the Board has been drawn to the general policy of the management, particularly with reference to the provision which has been made for dividends and which should be made for the highest reasonable efficiency. The original capital of the Company was $130,000, which was increased from time to time until it amounted in 1873 to $220,000, at which sum it has since remained. Since 1885 it has paid in dividends at an average rate of nearly 11 per cent., including a special dividend of 20 per cent. in 1894.

"Its original works were built by a contractor, who took for his pay the entire amount of stock originally issued. For many years no charges whatever were made for depreciation; these have never exceeded 1 per cent. in any year, and have usually been not more than ¾ of 1 per cent.

"At the same time, although the annual charges for repairs have been uneven in amount, and when computed upon the cost per 1,000 have sometimes seemed to be too high, no considerable sum seems ever to have been charged in this way which should have been charged to construction accounts.

"The tendency, on the whole, has seemed to be liberal toward construction rather than operating accounts. When the Board recommended a reduction in price to $1.50, the Company had accumulated out of its earnings about $45,000, which was invested in interest bearing securities readily convertible into cash.

"In referring to this reserve, the Board said in its findings: 'They have to-day an undoubted legal right to convert these securities into cash and to divide the proceeds in the same manner as they would distribute any other portion of their profits. Such a course, however, would unquestionably be against the interests of the corporation and would probably prove fatal to its prosperity.'

"It would seem that the Company is under obligation to so use a surplus of this character that substantial advantages may accrue from it to the public, and such a course will bring added strength to the corporation itself.

"From an examination of the works it is apparent that, in the interest of the public, there is a demand for the investment in the plant of a portion of this surplus and for yet a larger portion in the near future, if the demands upon the Company increase as in the past.

"Notwithstanding the earnest presentation to the Company of this view, the correctness of which has been fully demonstrated by subsequent events, the directors ordered the conversion of these securities into cash and the division of the proceeds, to the amount of $44,000, among the shareholders.

"The natural result of the policy thus outlined has been that the Company has to-day a plant whose structural value is probably less than its capital stock, and is now confronted with a demand for a liberal expenditure for extraordinary repairs needed in the interest of the consumers, and the shareholders as well.

"Had the management of the Company been disposed to pursue a more liberal policy towards the corporation as such, conserving for its advantage a portion of the sums divided among the shareholders, the Company might now be able to produce its gas with the highest economy and deliver it to the consumers at a lower price without impairment of capital or dividends.

"As the conditions exist, however, it is difficult to see how the expenditures now needed can be met without either a higher price or a lower dividend rate than might otherwise be fair and reasonable. The responsibility for this condition seems to be so clearly upon the management that it does not seem to be the duty of the Board to provide for these expenditures out of the price of gas or to require consumers

to again contribute through the maintenance of the present price what they have already once contributed for such a purpose.

"The conditions seem to entitle consumers to a reduction in price and to imperatively demand, for the proper conserving of the interests of the shareholders, a reduction of dividends until such expenditures have been made upon the plant as will equip the Company to supply gas at a reasonably low price with a fair profit.

"For the reasons indicated, the Board recommends that from and after the 1st day of March next the net price of gas sold by the East Boston Gas Company shall not exceed $1.25 per 1,000 feet."

MR. WM. P. LOGAN, one of the pioneer oil operators in the Pennsylvania petroleum field, died at his home in Bryn Mawr, Pa., the night of the 13th inst. He was in his 72d year.

AT a meeting of the new shareholding interests in the Petersburg (Va.) Gas Light Company the following officers were elected: President, Mr. R. D. Apperson; Directors, F. H. Shelton, Frank Battles and C. J. Lippman, of Philadelphia; J. D. Horsley, of Lynchburg; and R. D. McCue, of Staunton.

THE Cincinnati Gas Light and Coke Company proposes to construct a large gasholder on its McMillan street site. The only inkling we have as to its dimension relates to its diameter, which it is said will be 225 feet.

THE proprietors of the New Haven (Conn.) Gas Company have applied to the Legislature for an amendment to their charter, under which the Company may issue bonds amounting to the full face value of its capital stock.

THE properties of the Eldorado (Kas.) Light and Fuel Company have been sold to Mr. Martin W. Jones, of Rochester, N. Y.

MR. J. C. FULLER, owner of the Winfield (Kas.) Gas Company, died in that city about a fortnight ago.

MR. JOHN HAUG, Receiver of the Faribault (Minn.) Consolidated Gas and Electric Company, has issued a circular to the residents of that city in which he declares that the Company has been furnishing electric currents at rates lower than the cost of manufacturing and distributing the same. In order that the Company may hereafter make itself at least even on such supply, notice is given that the rate has been advanced to 10 cents per kilowatt. The gas rates at Faribault are: For an illuminating use, $1.80 per 1,000 cubic feet; for cooking and heating use, $1.60; for use in gas engines, $1.20—all net per 1,000.

AT the annual meeting of the Syracuse (N. Y.) Gas Company these officers were elected: Directors, James J. Belden, William B. Kirk, F. W. Baker, F. J. Baker, J. L. Cheney, John J. Cummins, A. C. Driscoll, Albert K. Hiscock, W. H. Haberle, W. E. Tanner, G. E. Warner, George A. Wood and M. Whelan; President, A. K. Hiscock; Vice President, Wm. B. Kirk; Secretary, F. W. Barker; Treasurer and General Manager, John J. Cummins.

A BILL is now before the Missouri Legislature which provides that the office of inspector of illuminating gas and of gas meters shall be created and filled for cities in that State having 50,000 inhabitants or more. Its sponsor is Senator Smith, of St. Louis.

THE Central Gas Fixture Company, of Minneapolis, Minn., has filed articles of incorporation. It is capitalized in $10,000, and its projectors are: George W. Frey, A. R. Hildreth and M. H. Boutell, all of Minneapolis.

WRITE to Mr. John Cabot, of 553 to 557 West 33d street, New York, for copies of his current circular respecting trays for gas works.

AT the annual meeting of the Lakewood (N. J.) Gas Company the officers elected were: Directors, Edwin R. Case, Stephen H. Plum, Ernest F. Millar, Chas. D. Thompson, A. L. Fennessy, A. H. Kelsall, E. J. Westall, J. B. Hoff, W. C. O'Leary, A. M. Bradshaw, George E. Smith and J. B. Clleveland; President, E. R. Cate; Vice President, Stephen H. Plum.

THE new net selling rate at Salem, Mass., is $1.25 per 1,000—gross, $1.45, less 20 cents for prompt payment.

MR. M. C. OSBORNE has been appointed Manager of the gas and electric lighting plants of Chico, Cal., recently purchased by Mr. John Martin.

MR. GEORGE HOWARD KIDDER, who at one time was in the service of the Boston Gas Light Company, and since 1896 was connected with the Edison Electric Illuminating Company, of Boston, died at his home in West Somerville, Mass., the morning of the 12th inst. Deceased was in his 30th year.

MR. NATHAN WARREN has been elected Treasurer and Clerk of the Waltham (Mass.) Gas Company, vice the late Mr. George M. Stearns.

ADVICES from Connecticut are to the effect that Senator Bradley, of Westport, Conn., has introduced in the State Legislature a bill which provides for the appointment of a State Board of Gas and Electric Light Commissioners. The commission is to have 3 members, their term of office is to be 6 years, and the salary is to be $2,500 per annum, the salaries and other expenses of the commission to be met by a tax on the gas and electric light companies levied in proportion to their respective gross receipts. The various companies are required to make an annual report to the Board. Upon the written and properly certified complaint of 25 consumers served by a single company, that the quality of the gas or electricity supplied is under the requirements of the law, or that the rates charged therefor are excessive, the Board shall order a hearing, and if the complaint is verified the Board shall prescribe such remedy as it deems fit. Failure to comply with such order is punishable by a fine, which the attorney general is authorized to collect. In its general features the proposed act closely resembles the act under which the Massachusetts Board of Gas and Electric Light Commissioners operates.

UNDER a decree of foreclosure made by the Circuit Court of the United States for the district of Kentucky, Emmett W. Bagley will sell at public auction the 20th prox., all the rights, properties, etc., of the Paducah (Ky.) Gas Light Company. The sale will be held in the McCracken County Court House, Paducah, at noon of the day mentioned. No bid less than $60,000 will be accepted.

THE Security Trust Company, of New York, acting for a syndicate, is said to have purchased very much over a controlling interest in the stock of the Springfield (Mass.) Gas Light Company. The reported price paid is $185 per share.

MR. GEORGE O. KNAPP has been elected President of the Peoples Gas Light and Coke Company, of Chicago, vice Mr. C. K. G. Billings, who declined a re-election. That Mr. Billings does not intend to retire from active participation in the affairs of the Company, is shown in his acceptance of the position of Chairman of the Board of Directors.

THE incorporation of the Standard Meter Company to manufacture gas and electric meters, is reported. Its capital stock is $100,000, its principal place of business is Camden, N. J., and its incorporators are: E. H. Rogers, R. H. Herley, Jr., Frank R. Hansel and George W. Jacobs.

M. F. LEACH has applied for a franchise to construct and operate a gas plant in Boulder, Col.

THE Chicago Heights Gas Company, to supply gas in the named Chicago suburb, has been organized by Messrs. M. McGregor, F. E. von Ammon and Arthur H. Pugh. It is capitalized in $100,000.

THE Citizens Gas Company, of Jacksonville, Fla., is arranging for an extensive system of main renewals and extensions.

AT the annual meeting of the Leominster (Mass.) Gas Company, the officers elected were: Directors, G. F. Morse, H. M. Lane, N. Harwood, G. A. Lane and C. A. Joslin; President, N. Harwood; Clerk and Treasurer, H. M. Lane; Auditor, George F. Morse.

MR. CHARLES H. DICKEY has been elected Vice-President of the Consolidated Gas Company, of Baltimore, Md.

THERE is said to be absolutely no truth in the rumor that the Cincinnati Gas Light and Coke Company is to be absorbed by the North American Company.

THE works of the Titusville (Pa.) Gas Company were damaged by fire the morning of the 14th inst. This is the second happening of the sort to that plant this month.

MR. SAMUEL T. MURDOCK, of Lafayette, Ind., has been appointed General Manager of the Indiana Natural and Illuminating Gas Company. His headquarters will be in Lafayette.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

CHAS. E. SANDERSON,
MANAGER.

MONDAY, FEBRUARY 25, 1901.

The Market for Gas Securities.

The market for city gas shares displayed little animation since time of last writing, but values have been fairly well maintained. Consolidated opened to day (Thursday) at 193 bid, and the closing quotation was 193½ bid, offered at 194. There was very small trading in it. The raft of bills aimed against the gas interests by the Albany statesmen make but small headway, and the general belief is that nothing unjust to such interests will go through this year. The quotations given for Standard common, and Mutual are completely nominal. The demand for good gas bonds is still very much in evidence.

The feature of to-day's gas share market was a slump in Brooklyn Union, the closing in which was made at 174 to 175. There is no reason whatever for the decline, unless it is that some people are figuring on the poor physical condition of the Company's works' system. This state, however, should not be taken seriously, since there is small doubt that the Company's cash or invested surplus is fully ample to pay for a brand new, up-to-date plant. Peoples, of Chicago, remains fairly steady, as does Baltimore Consolidated. Indianapolis gas is often pressed for sale, and Lacledes are also on the weak list.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 Wall Street, New York City.

February 25.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$54,595,200	100	193½	194
Central Union, Bonds, 5's.	3,000,000	1,000	108½	109½
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	120	..
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	295	299
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co. .. Bonds, 5's	11,000,000	1,000	108¼	109
Northern Union, Bonds, 5's.	1,250,000	1,000	104	104¼
New York and East River .. Bonds 1st 5's	3,500,000	1,000	103	103½
" 1st Con. 5's	1,500,000	..	115	..
Richmond Co., S. I.	348,650	50	70	..
" Bonds	100,000	1,000	..	..
Standard	5,000,000	100	130	132
Preferred	5,000,000	100	148	150
Bonds, 1st Mortgage, 5's	1,500,000	1,000	110	114
Yonkers	299,620	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	174	175
" " Bonds (5's)	15 000,000	1,000	118	119
Bay State	50,000,000	50	1	1½
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	28	35
" 1st Mtg. 5's	503,000	1,000	96½	99½
Boston United Gas Co.— 1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	7	10
" " Bonds, 5's	5,250,000	1,000	68	71
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Central San Francisco	2,000,000	..	106	108
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati G. & C. Co.	8,500,000	100	194	198
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	106	107
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	60	65
Preferred	3,026,500	100	84	86
Consumers, Jersey City Bonds	600,000	1,000	102	103
Consumers, Toronto	1,700,000	50	215	216
Consolidated, Baltimore	11,000,000	100	58½	59
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's.	1,000,000	..	..	..
Equitable, 1st 6's.	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	12	16
" Con. Mtg. 5's	380,000	1,000	80	85
Consolidated G. & E. Co.'s., Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co	4,560,000	50	88	89
" Prior Lien 5's	4,737,000	1,000	99½	100
Detroit Gas Co., 5's	381,000	1,000	100	101
" Inc. 5's	16,000	100	94	94½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	35	40
Fort Wayne	2,000,000	..	35	41
" Bonds	2,000,000	..	60	64
Grand Rapids Gas Lt. Co..	1,000,000	50	103	105
" 1st Mtg. 5's	1,225,000	1,000	..	..
Hartford	750,000	25	240	250
Hudson County Gas Co., of New Jersey	10,500,000	..	25	..
" Bonds, 5's	10,500,000	..	101	103
Indianapolis	2,000,000	..	45	55
" Bonds, 6's	2 650,000	..	94⅞	96
Jackson Gas Co	250,000	50	70	75
" 1st Mtg. 5's	265,000	1,000	101	102½
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	101½	103
Laclede, St. Louis	8,271,000	100	73½	75½
Preferred	2,500,000	100	97	100
Bonds	10,000,000	1,000	108½	109
Lafayette Gas Co., Ind.	1,000,000	100	40	50
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	110	120
Madison Gas & Elec. Co.	400,000	100	62	65
" 1st Mtg. 6's	350,000	1,000	102½	108
" 6 per cent. scrip, due 1901	100,000	25	87	89
Montreal, Canada	2,000,000	100	182	184¾
Newark, N. J., Con. Gas Co	6,000,000	..	..	55
Bonds, 6's	4,600,000	..	..	103
New Haven	1,000,000	25	280	300
Nashville Gas Lt. Co.	1,000,000	50	110	..
Oakland, Cal.	2,000,000	..	46	47
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	100¼	101
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	105
Rochester Gas & Elec. Co..	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	47¼	47½
St. Paul Gas Light Co.	1,500,000	100	45	47
1st Mortgage 6's.	650,000	1,000	82	85
Extension, 6's	600,000	1,000	..	..
General Mortgage, 5's..	2,465,000	1,000	88	90¼
St. Joseph Gas Co	1,000,000	100	35	40
" 1st Mtg. 5's	750,000	1,000	96½	98
Syracuse, N. Y.	1,750,000	100	11½	14
Bonds	1,612 000	1,000	88½	93
Washington, D. C	2,600,000	20	307½	312½
First mortgage 6's	600,000	..	..	..
Western, Milwaukee	4,000,000	100	94¾	95½
Bonds, 5's	3,830,500	..	106½	107½
Wilmington, Del.	600,000	50	200	201

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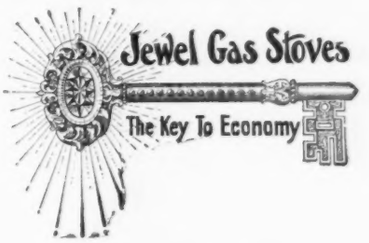

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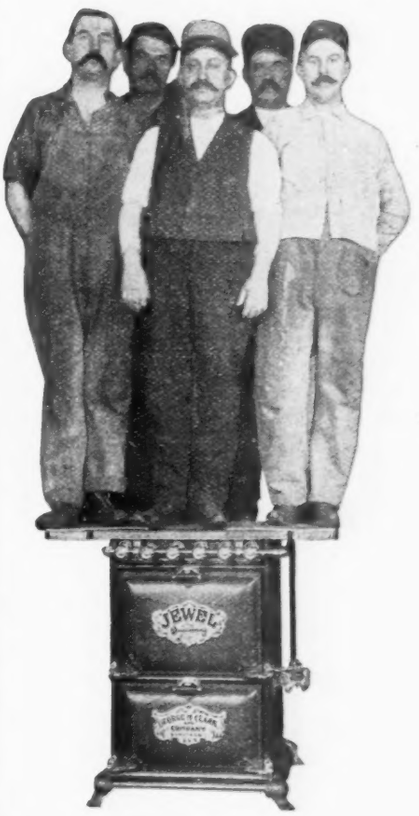

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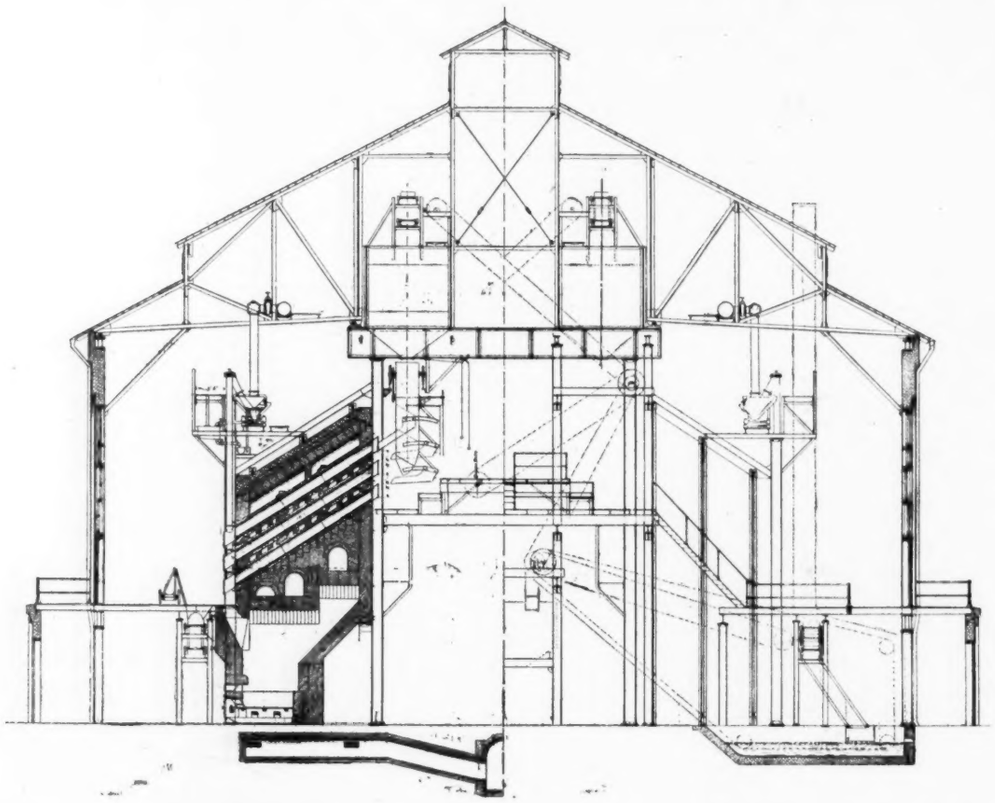

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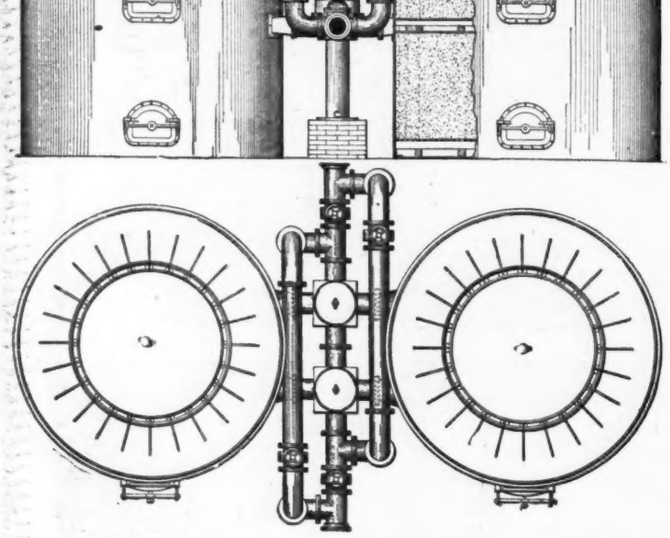

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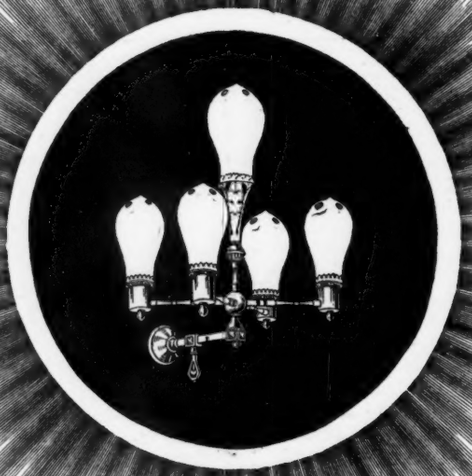

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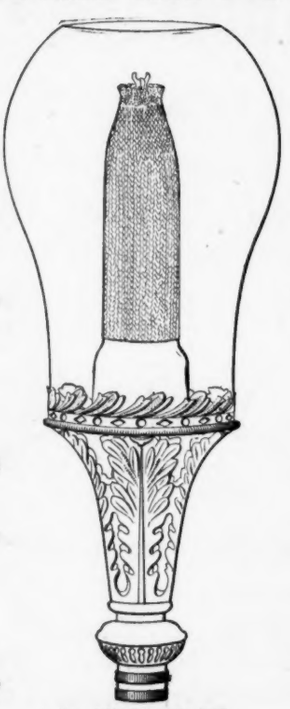

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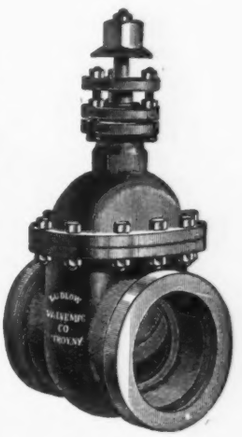

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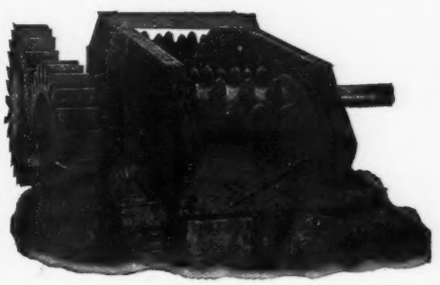

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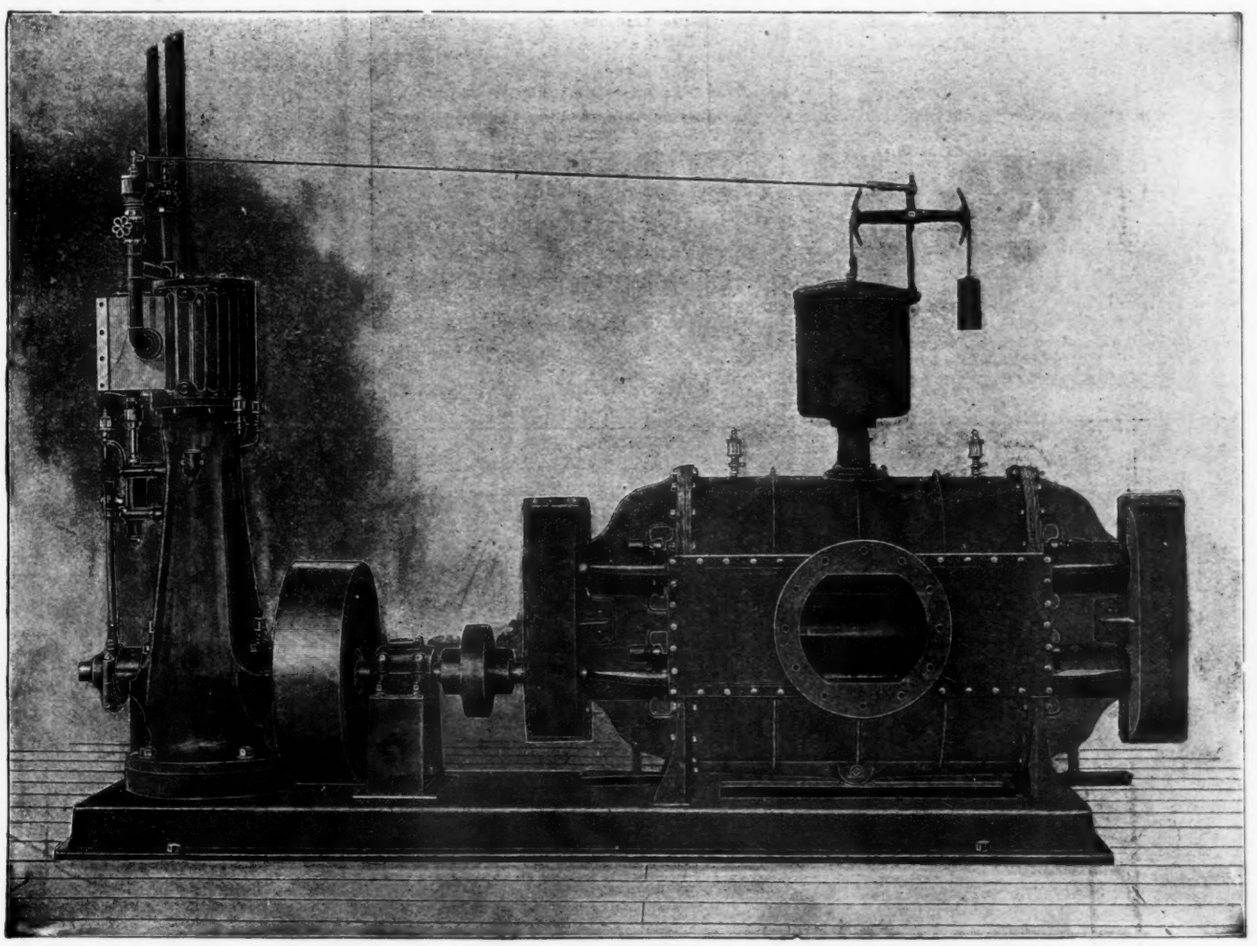

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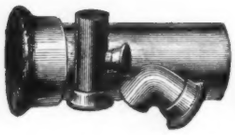

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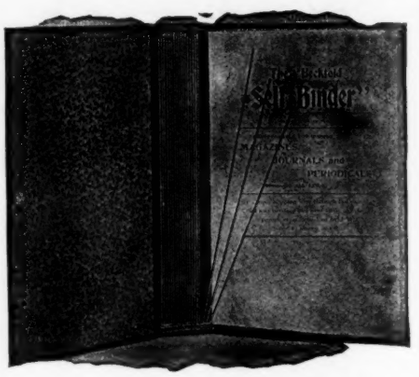

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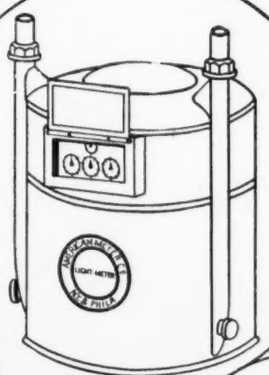

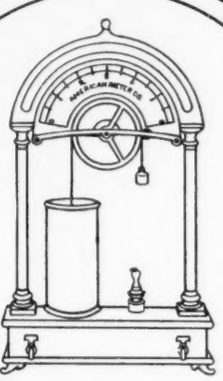

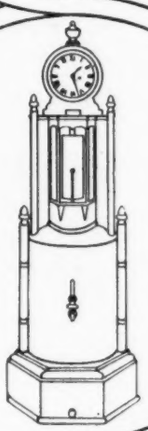

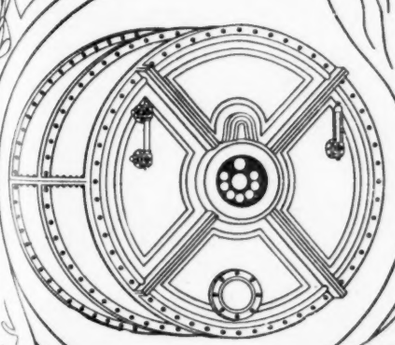

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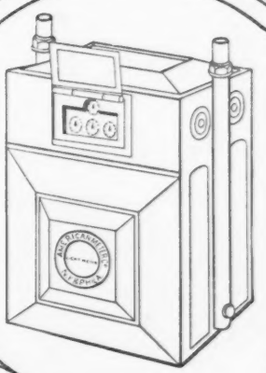

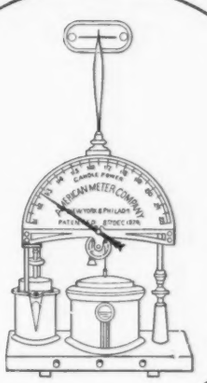

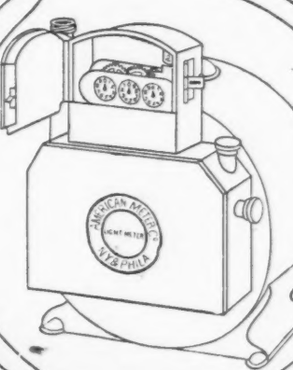

PUBLIC LIGHTING TABLE.

MARCH, 1901.

Day of Week.	Table No. 1. Following the Moon. Date.	Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Fri.	1	3.40 AM	5.40 AM	5.30	5.45
Sat.	2	4.20	5.40	5.30	5.45
Sun.	3	No L.	No L.	5.30	5.45
Mon.	4	No L. FM	No L.	5.30	5.45
Tue.	5	No L.	No L.	5.40	5.35
Wed.	6	6.30 PM	8.30 PM	5.40	5.35
Thu.	7	6.30	9.30	5.40	5.35
Fri.	8	6.30	10.30	5.40	5.35
Sat.	9	6.30	11.20	5.40	5.35
Sun.	10	6.30	12.20 AM	5.40	5.35
Mon.	11	6.30	1.10	5.40	5.35
Tue.	12	6.30	2.00	5.50	5.20
Wed.	13	6.30 LQ	2.50	5.50	5.20
Thu.	14	6.30	3.40	5.50	5.20
Fri.	15	6.30	4.20	5.50	5.20
Sat.	16	6.30	5.00	5.50	5.20
Sun.	17	6.40	5.00	5.50	5.20
Mon.	18	6.40	5.00	5.50	5.20
Tue.	19	4.40	5.00	6.00	5.10
Wed.	20	6.40 NM	5.00	6.00	5.10
Thu.	21	6.40	5.00	6.00	5.10
Fri.	22	6.40	5.00	6.00	5.10
Sat.	23	6.40	5.00	6.00	5.10
Sun.	24	6.50	4.50	6.00	5.10
Mon.	25	11.30	4.50	6.00	5.10
Tue.	26	12.20 AM FQ	4.50	6.10	4.55
Wed.	27	1.10	4.50	6.10	4.55
Thu.	28	1.40	4.50	6.10	4.55
Fri.	29	2.20	4.50	6.10	4.55
Sat.	30	2.50	4.50	6.10	4.55
Sun.	31	3.20	4.50	6.10	4.55

TOTAL HOURS LIGHTING DURING 1901.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	220.10	January	423.20
February	192.30	February	355.25
March	180.00	March	355.35
April	158.30	April	298.50
May	140.40	May	264.50
June	135.40	June	234.25
July	138.00	July	243.45
August	156.20	August	280.25
September	174.40	September	321.15
October	202.30	October	374.30
November	220.40	November	401.40
December	241.30	December	433.45
Total, yr.	2161.10	Total, yr.	3987.45

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.... OF AMERICA ....

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THE INCOMPARABLE

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FINEST EXAMPLE

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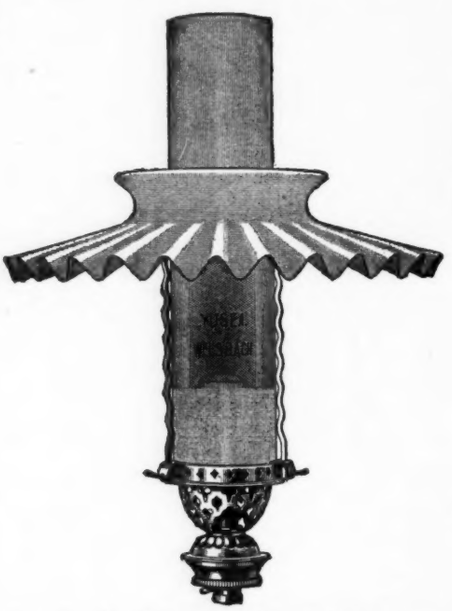

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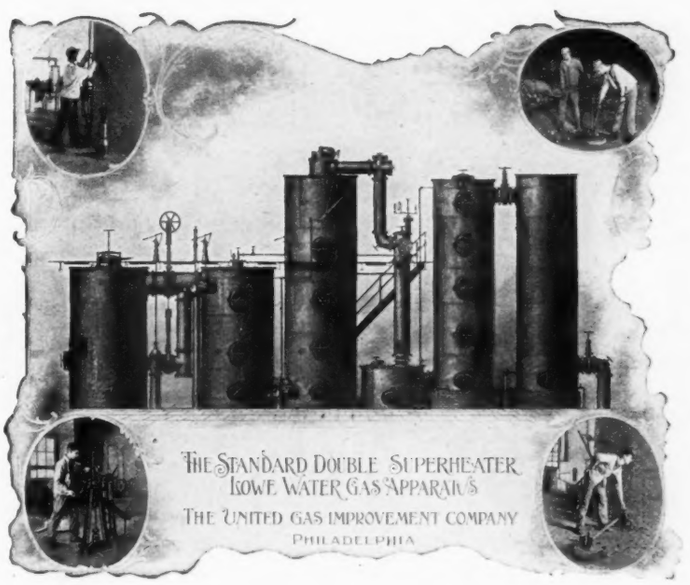
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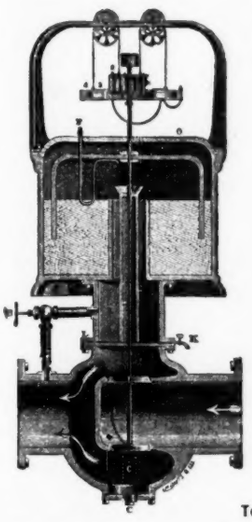

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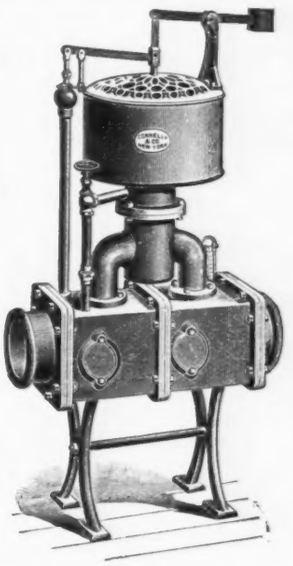

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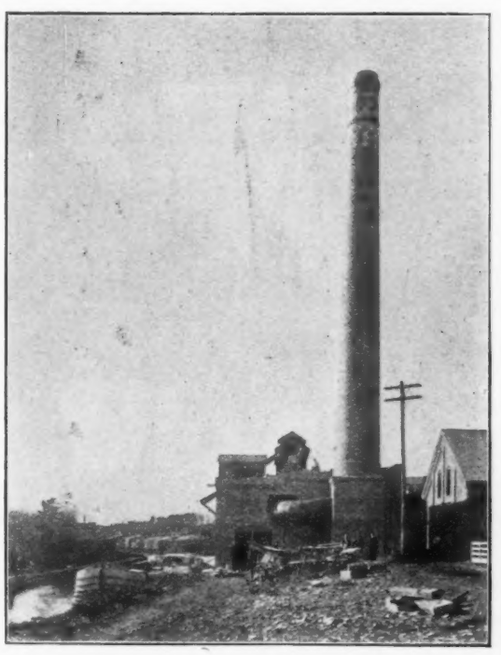

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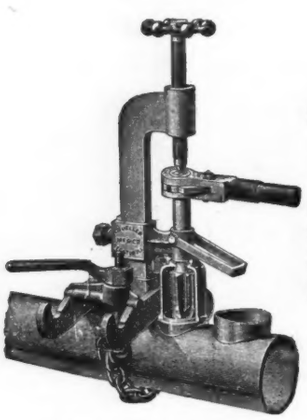

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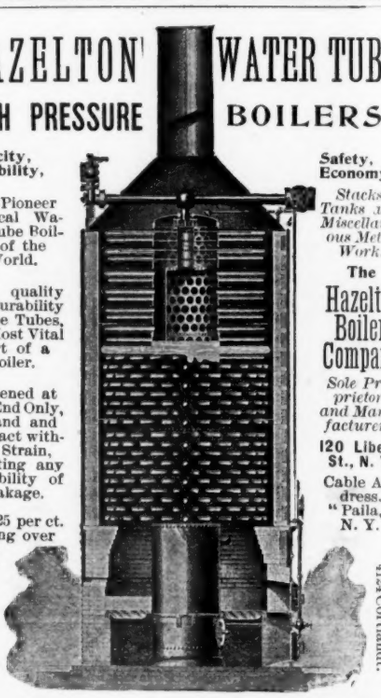

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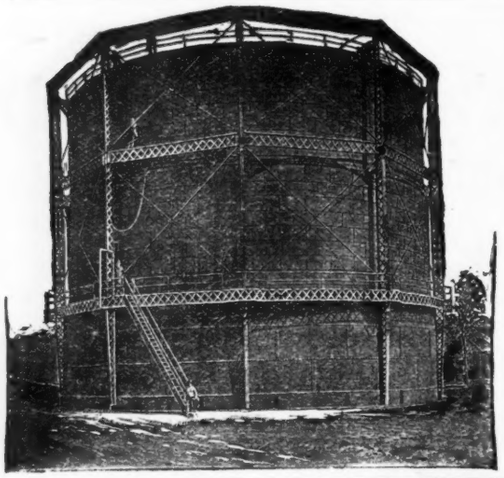

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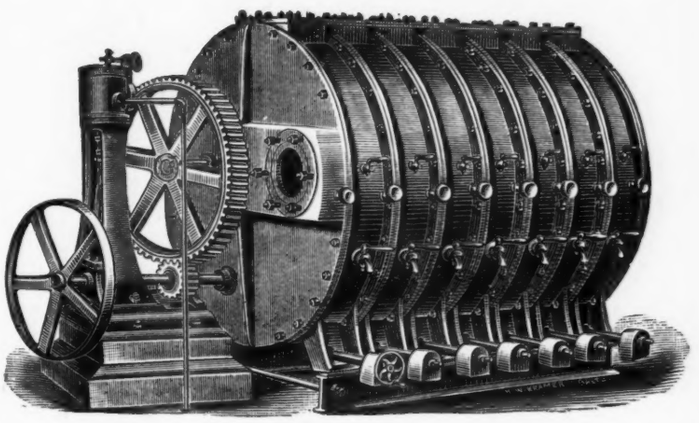

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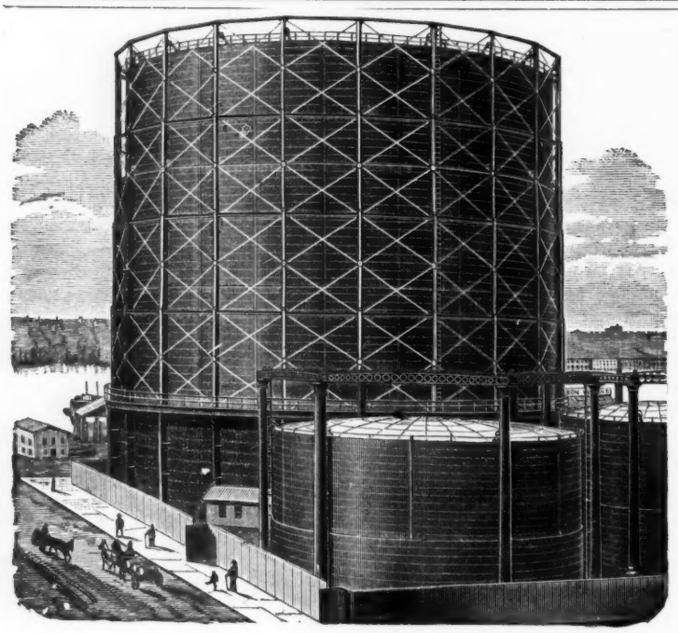

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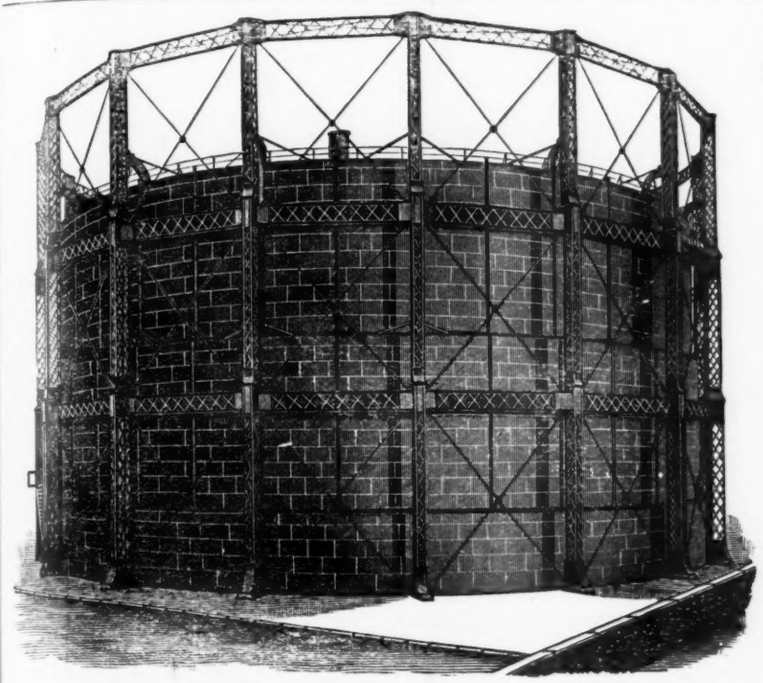

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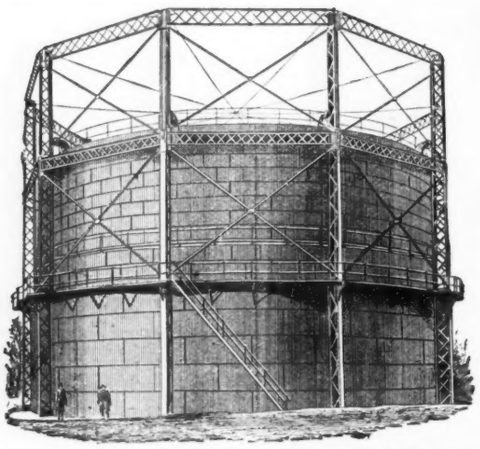

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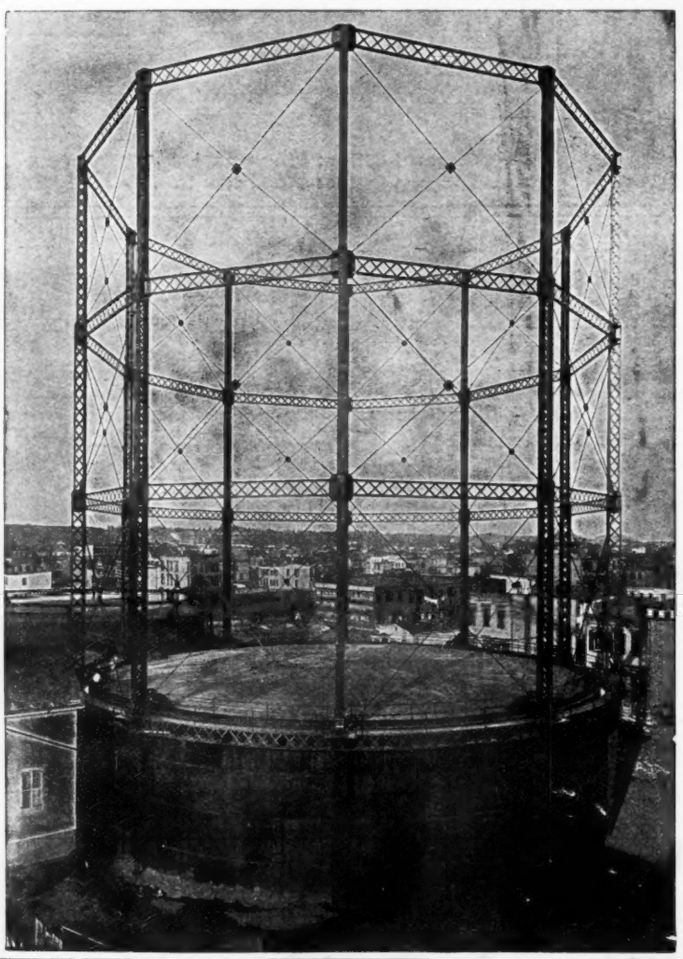

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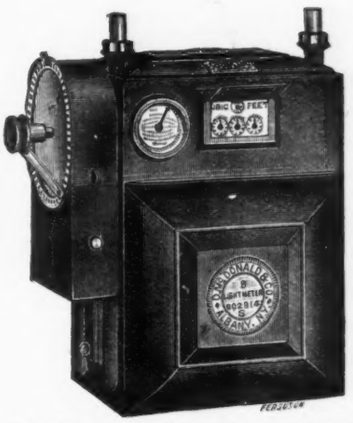

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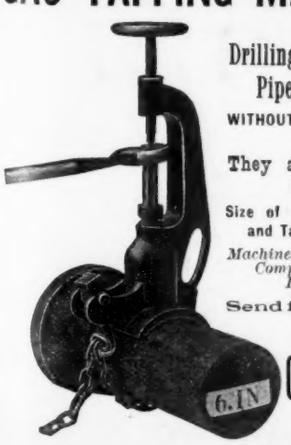

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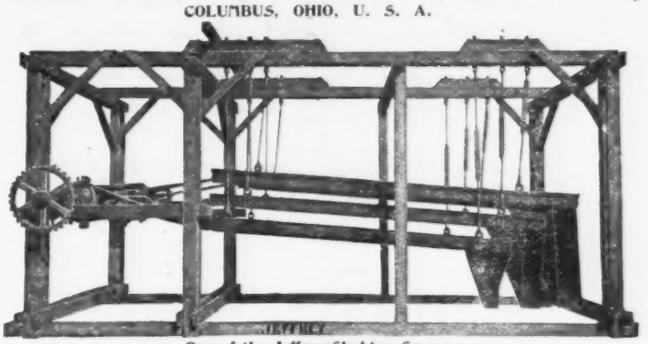

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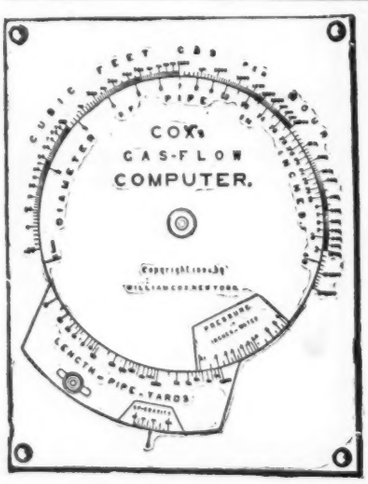

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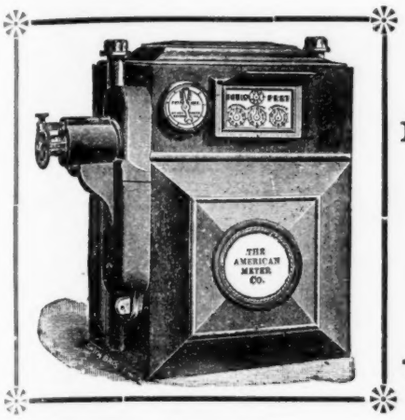

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